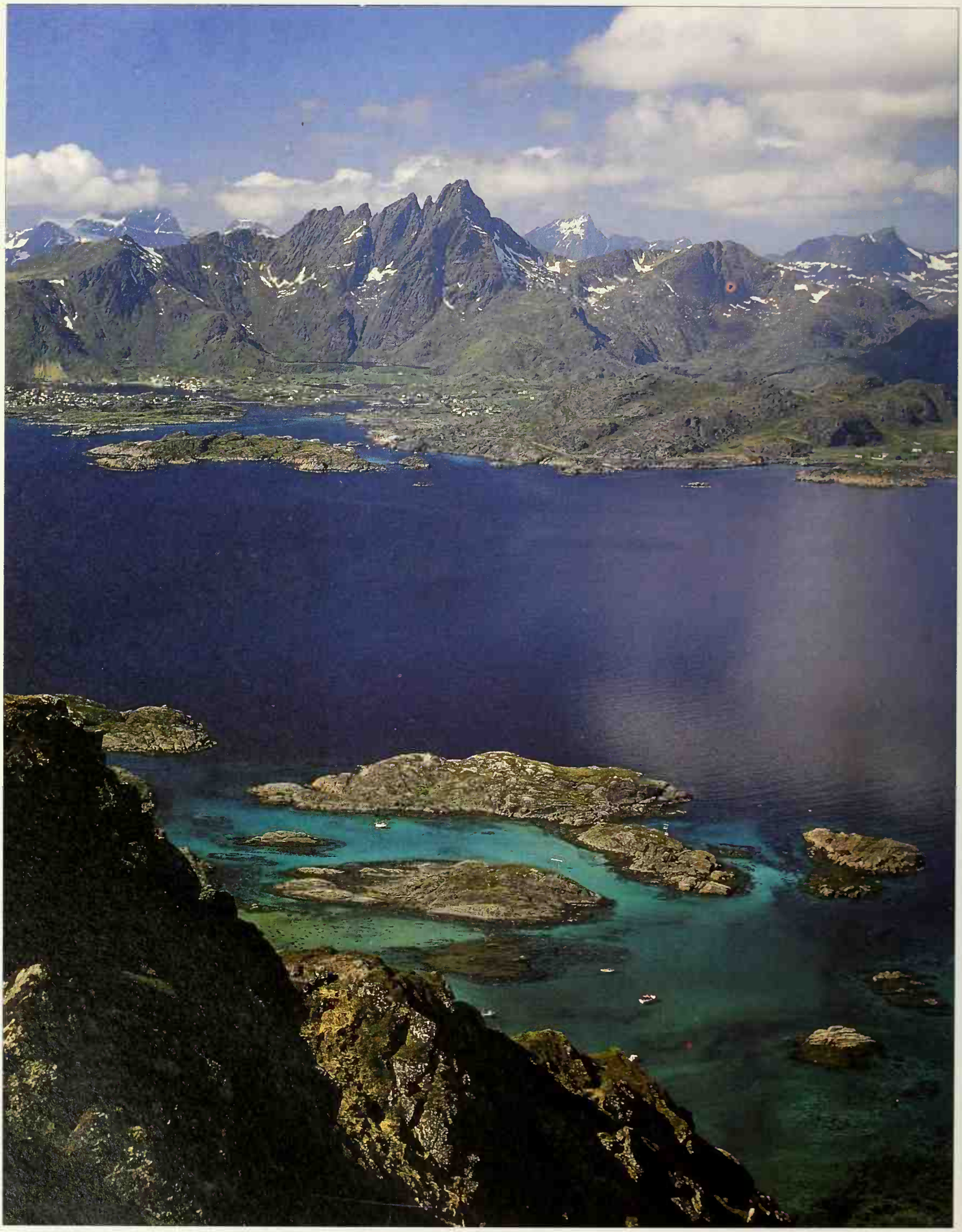
ENCYCLOPEDIA OF WORLD GEOGRAPHY

The Nordic Countries

ENCYCLOPEDIA OF WORLD GEOGRAPHY



ENCYCLOPEDIA OF WORLD GEOGRAPHY

VOLUME SIX

The Nordic Countries

Marshall Cavendish
New York · Toronto · Sydney

Marshall Cavendish Corporation,
2415 Jerusalem Avenue,
P.O. Box 587,
North Bellmore,
N.Y. 11710,
U.S.A.

AN ANDROMEDA BOOK

Planned and produced by
Andromeda Oxford Ltd
11–15 The Vineyard, Abingdon,
Oxfordshire OX14 3PX, England

Library of Congress Cataloging-in-Publication Data

Encyclopedia of world geography / consultant editor, Peter Haggett : specialist subject editors, Kenneth J. Gregory . . . [et al.] ; editorial director, Graham Bateman.
p. cm
Includes bibliographical references and index.
ISBN: 1-85435-631-3 (set) :
1. Geography--Encyclopedias, Juvenile. [1. Geography--Encyclopedias.] I. Haggett, Peter. II. Bateman, Graham.
G133.E48 1994
910'.3--dc20 93-24969
CIP
AC

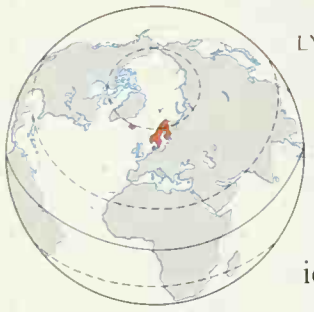
Origination: Scantrans, Singapore

Printed by:
L.E.G.O. S.p.A., Vicenza, Italy

This page: *A Lapp wedding celebration*
Title page: *The Lofoten island group off the northwest coast of Norway*

CONTENTS

INTRODUCTION



The Nordic Countries

LYING ALONG THE NORTHERN BOUNDARY OF EUROPE, and including large areas within the Arctic Circle, the Nordic Countries were the last part of the continent to be freed from glaciation some 10,000 years ago. The effects of the end of the ice age are still evident today. The land around the Baltic Sea and the Gulf of Bothnia is still slowly rising, leaving raised shorelines, abandoned ports, chaotic drainage systems and extensive regions of lakes. Norway's Atlantic coast is heavily indented by long glacier-carved valleys called fjords, while Denmark's landscapes were fashioned from the remains of glacial moraines. Iceland contains Europe's second-largest ice sheet, and its landscape is also shaped by the continuing geological activity along the Mid-Atlantic ridge, where the new island of Surtsey appeared in 1963.

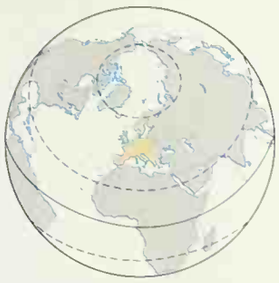
The region is mostly mountainous and forested, drained by short, fast-flowing rivers that often feed hydroelectric stations – the second most important source of power after oil. Within the Arctic Circle, Lapland's Sami people continue to herd reindeer and, by agreement, freely cross national boundaries in pursuit of their nomadic way of life. Although productive agriculture is maintained on the few lowlands, the sea provides much of the region's food. Warmed by the North Atlantic Drift, the North sea is rich in cod and herring, while salmon spawn in Norway's rivers and in its coastal fish ranches.

Cultural homogeneity is an important feature in each of the Nordic Countries. Norway, Denmark and Sweden share similar languages and the Lutheran church is the largest single religious group throughout the region. This common culture has fostered two of the region's political traditions – social democracy and state welfare. Many commentators feel that the Nordic peoples' strong social and moral convictions are responsible for generating a commitment to international peace abroad, and to high standards of living, particularly for women at home. The League of Nations was first conceived here, the Nobel Institute is based in Sweden and the region has provided two Secretaries-General of the United Nations.

A continued spirit of cooperation will be necessary to solve the region's environmental problems, which have reached serious proportions. The shallow Baltic Sea has been poisoned by industrial and urban waste from other countries; and acid rain from northwestern Europe's industrial heartlands has damaged forests and lakes. Finding a solution is one of the most daunting challenges facing the Nordic governments today.

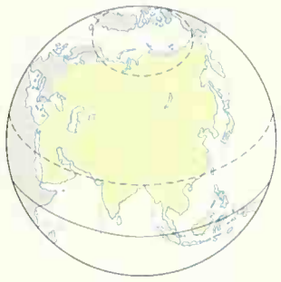
North America

Central and South America



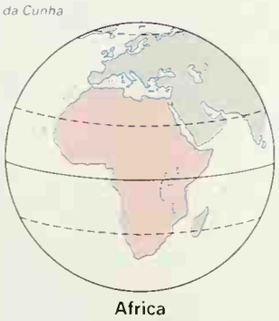
Europe

A ANDORRA
AL ALBANIA
AR ARMENIA
AU AUSTRIA
AZ AZERBAIJAN
BEL BELGIUM
B BOSNIA AND HERCEGOVINA
BU BURUNDI
CR CROATIA
CZ CZECH REPUBLIC
DEN DENMARK
DOM DOMINICAN REPUBLIC
EO EQUATORIAL GUINEA
HUN HUNGARY
L LEBANON
LITH LITHUANIA
LUX LUXEMBOURG
M MACEDONIA
NETH NETHERLANDS
R RUSSIA
RW RWANDA
SL SLOVAKIA
S SLOVENIA
SW SWITZERLAND
T TOGO
UAE UNITED ARAB EMIRATES
YU YUGOSLAVIA



Asia

ICELAND
NORWAY
SWEDEN
FINLAND
RUSSIA
ESTONIA
LATVIA
LITH
BELORUSSIA
UNITED KINGDOM
DEN
R
IRELAND
NETH
POLAND
GERMANY
BEL
CZ
UKRAINE
LUX
SL
AU
HUN
MOLDAVIA
FRANCE
SW
S
CR
ROMANIA
A
B
YU
BULGARIA
GEORGIA
PORTUGAL
SPAIN
ITALY
AL
M
GREECE
TURKEY
AR
AZ
KAZAKHSTAN
MONGOLIA
UZBEKISTAN
KIRGHIZIA
TURKMENISTAN
TAJIKISTAN
NORTH KOREA
SOUTH KOREA
JAPAN
CHINA
Gibraltar (UK)
MALTA
TUNISIA
CYPRUS
L
SYRIA
ISRAEL
IRAQ
IRAN
AFGHANISTAN
MOROCCO
JORDAN
KUWAIT
PAKISTAN
BHUTAN
NEPAL
ALGERIA
LIBYA
EGYPT
BAHRAIN
QATAR
UAE
SAUDI ARABIA
OMAN
BANGLADESH
TAIWAN
Hong Kong (UK)
Macao (Port)
INDIA
BURMA
LAOS
THAILAND
VIETNAM
CAMBODIA
PHILIPPINES
MALI
NIGER
CHAD
ERITREA
YEMEN
Socotra (Yem)
SUDAN
DJIBOUTI
BURKINA
BENIN
NIGERIA
CENTRAL AFRICAN REPUBLIC
ETHIOPIA
IVORY COAST
GHANA
LIBERIA
SRI LANKA
MALDIVES
BRUNEI
MALAYSIA
SINGAPORE
CAMEROON
SOMALIA
SAO TOME & PRINCIPE
EO
UGANDA
KENYA
GABON
Annobon (Eq)
RW
CONGO
ZAIRE
BU
Cabinda (Ang)
SEYCHELLES
TANZANIA
INDONESIA
PAPUA NEW GUINEA
Ascension (UK)
COMOROS
ANGOLA
MALAWI
ZAMBIA
SOLOMON IS
St Helena (UK)
MADAGASCAR
ZIMBABWE
VANUATU
NAMIBIA
MAURITIUS
Reunion (Fr)
BOTSWANA
MOZAMBIQUE
New Caledonia (Fr)
AUSTRALIA
SWAZILAND
SOUTH AFRICA
LESOTHO
Tristan da Cunha (UK)
Kerguelen (Fr)
NEW ZEALAND



Africa

Australasia, Oceania and Antarctica

Antarctica

The Nordic Countries

COUNTRIES IN THE REGION

NORWAY · SWEDEN · FINLAND

DENMARK · ICELAND

A tranquil fishing village *(left)* in the Lofoten islands, off the northwest coast of Norway. The sea has always played an important role in the region's economic and cultural life, and most of the population is found along the coasts. Fishing and sailing are popular leisure pursuits even with city dwellers.

Norway

KINGDOM OF NORWAY

NORWAY LIES ALONG THE WESTERN COAST of the Scandinavian peninsula. Although it is the fifth largest country in Europe, its spectacular scenery of rugged uplands, lakes and forests supports a relatively small population.

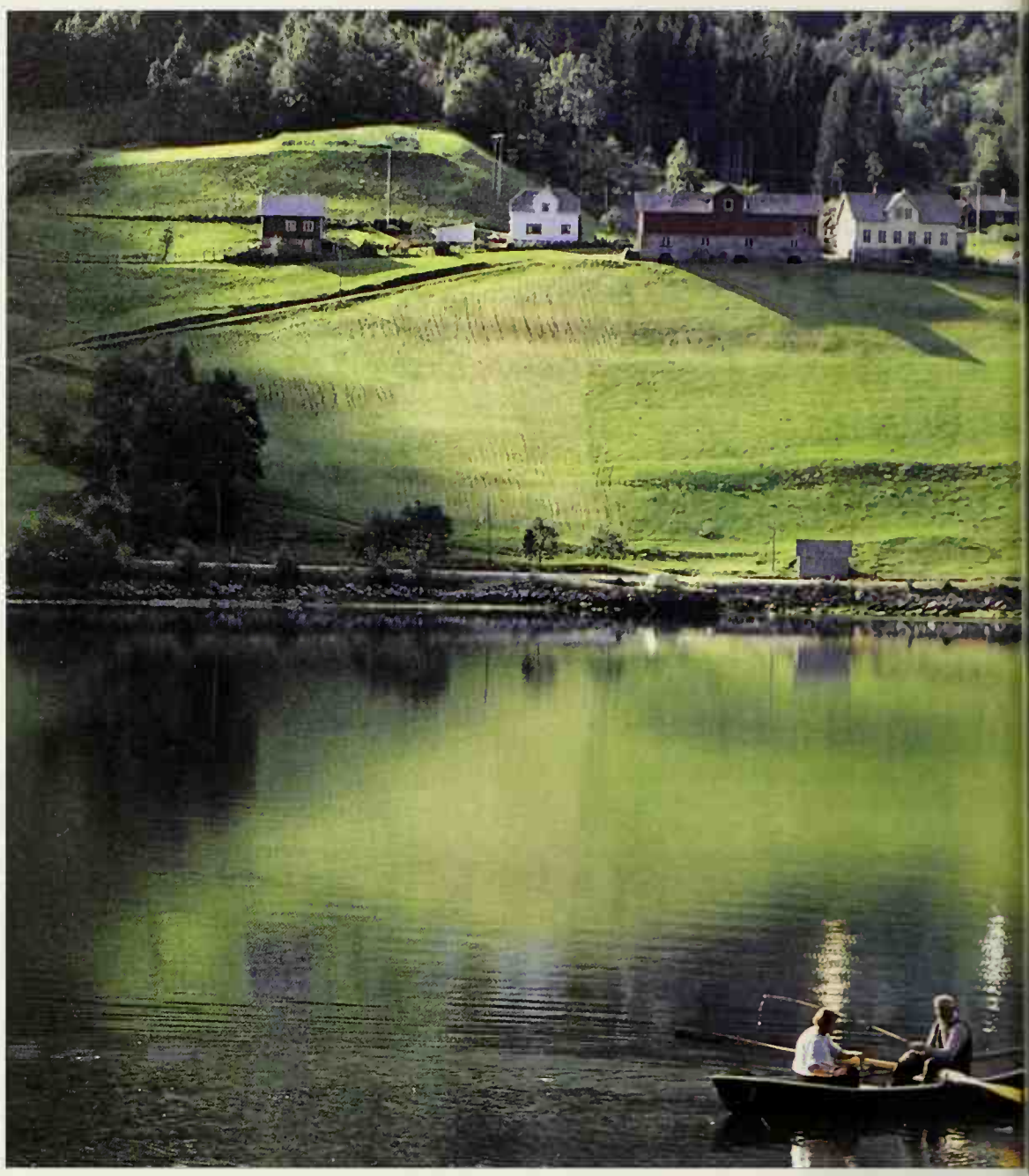
ENVIRONMENT

Norway is a long, thin country. Only 450 km (280 mi) across at its widest point, in places it narrows to only 80 km (50 mi). The influence of the warm North Atlantic Drift makes the climate unexpectedly mild for a northerly location.

The land

During the ice ages the ancient granite bedrock of Norway was heavily eroded by glaciers, and it continues to be worn down by the action of rivers and the sea. These forces have shaped a harsh landscape of high mountains and deep valleys. Many of the inland valleys gouged out by the ice have flooded and are now ribboned with lakes, of which there are more than 160,000 in the country, the largest being lake Mjøsa in the southeast. Along the coast the glacial valleys form fjords, or high-walled sea-lakes, that have turned the coastline into a convoluted maze flanked by some 50,000 islands.

The only substantial areas of lowland are in the southeast around the capital, Oslo. Rivers such as the Glåma and others running down from the mountains have created a network of fertile valleys and lakes, making this area the main agricultural center of the country. Two smaller lowland areas – the Trøndelag in central Norway around Trondheim, and Jæren near Stavanger in the southwest – are also important areas for farming.



A peaceful scene in summer Vetle Fjord is a northern arm of southern Norway's Sogne Fjord, the longest – at 184 km (115 mi) – of the country's great coastal inlets. It was carved out by the grinding action of glaciers during the last ice age, and flooded by the sea.

Glacial erosion has scoured some of the mountains flat, creating immense plateaus such as the Hardangervidda in central southern Norway. Farther north, across the center of the country, lies the main mountain range, Jotunheimen – the home of the giants in Old Norse myth. The range is crowned by spectacular peaks such as Galdhøpiggen and Glittertind. Toward the coast is the great icefield of Jostedalsbreen, from which glaciers still flow; the plateau of Dovrefjell lies a little to the north. Almost exactly at the midpoint of the country, beyond the Trøndelag, northern Norway begins. Lying mostly above the Arctic Circle, its jagged peaks and ridges, with numerous fjords and islands, end in the Finnmark Plateau. Norway also includes the bleak Arctic islands of Svalbard and Jan Mayen.

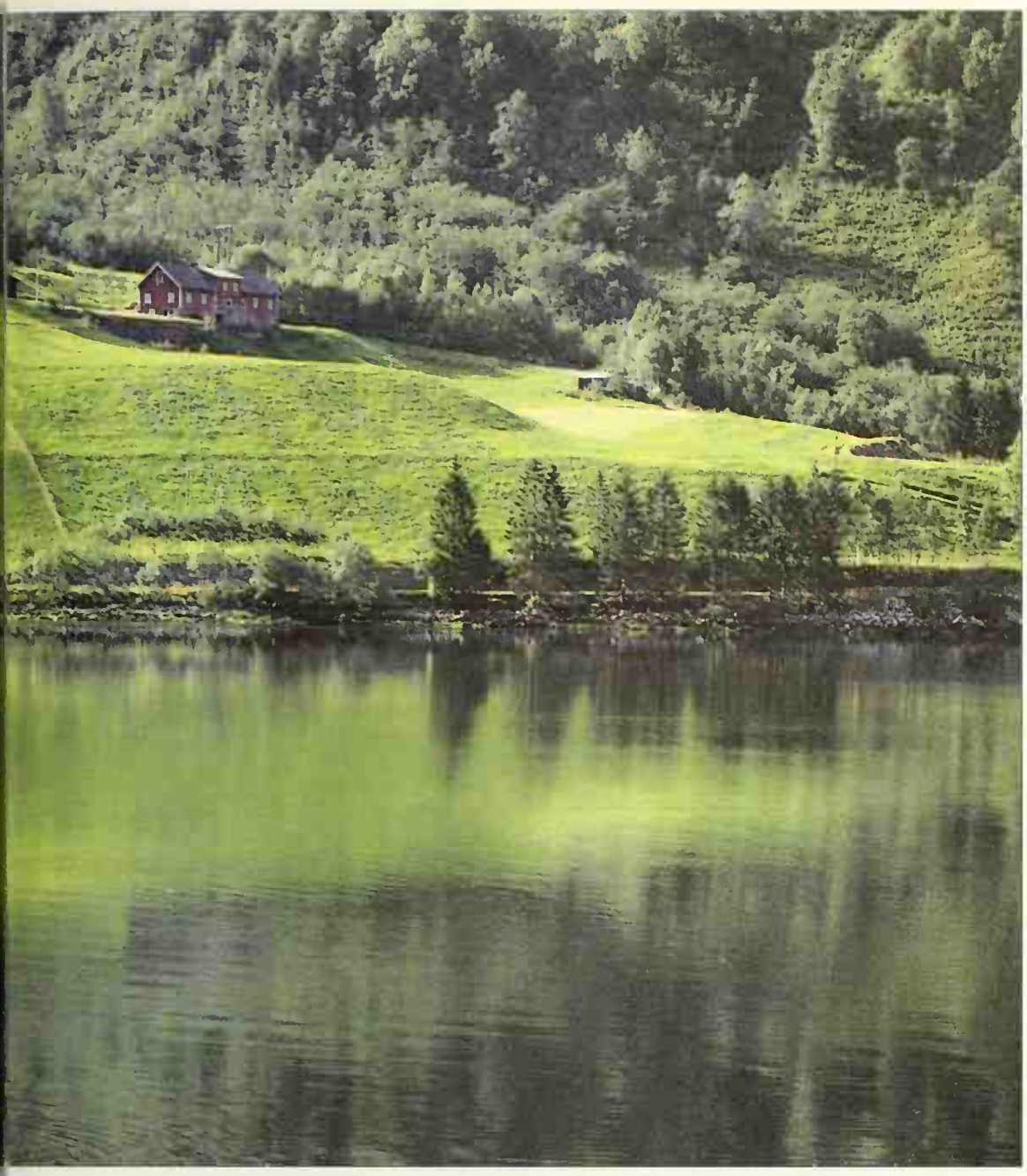
Climate

Below the Arctic Circle, Norway's mountain ranges divide the country into two main weather zones. The western, Atlantic coastal zone experiences high rainfall brought by the westerly wind system, and is also warmed by the North Atlantic Drift. This gives the country a relatively temperate climate, with cool summers and wet winters, even though it lies on the same latitude as Alaska. Eastern Norway has a more continental climate, with warmer summers, colder winters and lower rainfall.

Plants and animals

About one-quarter of the country is forested. Spruce and pine trees cover the eastern valleys, but broadleaf trees such as ash, mountain ash and aspen also flourish, as do birch and willow on some of the higher slopes. On the west coast,

Filigree of ice Snow lies on the ground on many days, and winters are long and dark. But the moderating influence of the warm North Atlantic Drift and westerly winds means that coastal waters are rarely frozen over even when the land is snowbound.



broadleaf and coniferous trees grow more or less equally, but toward the south broadleaf woodlands are dominant. Much of the southern forests have been cleared for agriculture and orchards.

Mosses and wild flowers carpet the forests, and the inland valleys support a rich variety of vegetation, including blueberries, cranberries and cloudberries – the fruits of which are a Scandinavian delicacy. In recent years large areas of forest, rivers and lakes have been killed or damaged by acid rain, caused by industrial air pollution from neighboring countries such as Britain and Russia.

In the subarctic north the land turns to tundra, becoming a stark, boggy grassland scattered with small birch trees. These wilder areas support arctic animals such as reindeer, wolverines and lemmings. In the southern forests elk and Red deer are common, along with martens, beavers and otters; larger predators such as wolves, bears and lynx have been hunted almost to extinction except in the far north. Partridge and grouse are common inland, and a wide variety of seabirds live in vast numbers along the coasts. The rivers that are unaffected by pollution contain trout and salmon.

NATIONAL DATA

Land area 323,878 sq km (125,050 sq mi)

Climate	Altitude m (ft)	Temperatures January °C(°F)	July °C(°F)	Annual precipitation mm (in)
Oslo	96 (315)	−5 (23)	17 (63)	740 (29 1)
Bergen	44 (144)	2 (36)	15 (59)	1,958 (77 1)

Major physical features highest point Glittertind 2,470 m (8,104 ft); longest river Glama 610 km (380 mi)

Population (1990) 4,212,000

Form of government multiparty constitutional monarchy with one legislative house

Armed forces army 19,000, navy 5,300, air force 9,100; others 700

Largest cities Oslo (capital – 726,000); Bergen (211,000); Trondheim (136,000)

Official language Norwegian

Ethnic composition Norwegian 95.8%; other Scandinavians 1.0%; British 0 4%; American 0 4%; others 2.4%

Official religion Lutheranism

Religious affiliations Lutheran 87.9%; nonreligious 3 2%; others 8.9%

Currency 1 Norwegian krone (NKr) = 100 øre

Gross national product (1989) US $92,097 million

Gross domestic product (per person 1990) US $17,220

Life expectancy at birth male 73.1 yr, female 79.6 yr

Major resources agriculture/fisheries 3 6% GNP; mining 13.2% GNP; manufacturing 14.3% GNP; trade 11.2% GNP; public administration/defense 15 0% GNP

SOCIETY

Norway's immense mountains and deep fjords have always made land travel and communications extremely difficult, so it is not surprising that the country has a long maritime and seafaring history.

History

The earliest settlers in Norway were hunter–gatherers from Central Europe who gradually moved north as the ice sheets retreated toward the end of the last ice age. By the 9th century AD settled farming was well established, and the agricultural land needed to support an expanding population was beginning to run out, so the settlers turned instead to seafaring, and to trading and raiding in other countries. They came from the coasts around the Skagerrak, the strait between Norway and Denmark, then called the Vik (an Old Norse term for a creek or inlet), and were known as Vikings – a name soon given to all Scandinavian pirate–adventurers. In the 9th and 10th centuries Vikings from Norway colonized much of Scotland, Ireland, northern England and parts of northern France (Normandy); they also settled in Iceland and Greenland, and from there crossed the Atlantic to North America.

In about 900, King Harald Fairhair (c. 860–940) united northern Norway and the formerly Danish-ruled southern Norway into a single kingdom. The coming of Christianity and the decline of the Viking era both strengthened the unified monarchy. The country prospered under King Haakon IV (1217–63) and his sons, but was devastated by the Black Death, the outbreak of bubonic plague that swept Europe, reaching Norway in 1350.

In 1397 Norway's royal line was combined with those of Sweden and Denmark in the Kalmar Union, beginning a political domination by Denmark that ended only in 1814. Following a brief bid for independence in that year, Norway was forced into a union with Sweden; however, the country did gain limited internal self-government under a shared constitutional monarchy. After a series of popular protests the Norwegian people made Sweden recognize their independence in 1905. The Swedish–Norwegian union was dissolved and a separate constitutional monarchy established in Norway under Prince Carl of Denmark, who was elected in a referendum and took the tile of Haakon VII (1872–1957).

Norway sought to remain neutral in World War II, but was occupied by the German army from 1940 until 1945. After the war, Norway joined the North Atlantic Treaty Organization (NATO) and the European Free Trade Association (EFTA), but rejected European Community (EC) membership in a 1972 referendum. Like Sweden and Finland, Norway had difficult relations with the Soviet Union, in particular over the development of natural resources along their common boundary in the far north.

Government

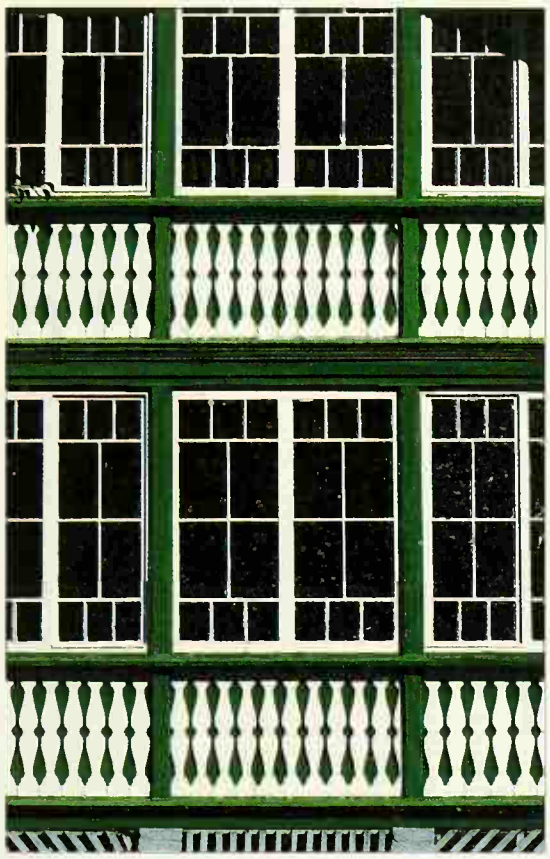
The constitutional form of monarchy that was adopted in 1814 remains the form of government today. The parliament, or Storting, is elected by universal adult suffrage for a four-year term. It sits as one or two chambers depending on the issue, and cannot be dissolved before the term is ended. The parliament selects a prime minister and cabinet, which are nominally appointed by the king, acting as head of state. The king's functions are mainly ceremonial; he retains a veto over all legislation, but this has never been used.

People

The majority of Norwegians share common cultural and ethnic origins with their Scandinavian neighbors; and the

The charm of Bergen (*left*) One of Norway's four principal cities, as well as the former capital, Bergen still retains a small-town charm. Its picturesque streets of brightly painted houses are set in a spectacular natural setting of steep hills overlooking a harbor on Norway's west coast.

Faces of the north (*right*) Young Sami (Lapp) children in distinctive, brightly colored clothing. Most Sami, who live in scattered groups in the far north of Norway, now work in fishing, farming or forestry, or depend on tourism. Only a handful still pursue their traditional way of life as nomadic reindeer herders on the Finnmark Plateau.



Architecture in wood (*above*) Timber from its abundant forests is the traditional building material of Norway, from its magnificent medieval stave churches to the smallest fishing cabin. This house front of the 1900s is a fine example of local craftsmanship.

Norwegian language is closely related to Danish and Swedish. After years of regional disagreement, two standard variants of the Norwegian language came to be finally recognized: Bokmål is the educated urban form, and Nynorsk (New Norse) is a more rural form based on western dialects. The two are gradually being combined into Samnorsk. Most Norwegians are members of the national Lutheran Church.

Some 20,000 Sami (Lapps) and 10,000 Finns make up the two main ethnic minorities. Each speaks its own language, which are related members of the Uralic family of languages (unlike the Scandinavian languages, which are Indo-European). They live mainly in their traditional homelands in the far north; some 2,000 Sami on the Finnmark Plateau are seminomadic reindeer herders.

Norway's long and distinguished cultural history reached a highpoint during the nationalist period of the late 19th and early 20th centuries, championed by figures such as the playwright Bjørnstjerne Bjørnson (1832–1910) and the violinist and composer Ole Bornemann Bull (1810–80). For such a small country, a large number of figures have become famous on the international stage, including the composer Edvard Grieg (1843–1907); the playwright Henrik Ibsen (1828–1906); the novelists Knut Hamsun (1859–1952) and Sigrid Undset (1882–1949); and the painter Edvard Munch (1863–1944). A notable line of famous scientist–explorers such as Fridtjof Nansen (1861–1930), Roald Amundsen (1872–1928) and Thor Heyerdahl (b. 1914) carried on the adventuring spirit of the Vikings.

ECONOMY

Norway's economy is chiefly industrial. Agricultural development is severely restricted by the harsh climate and the mountainous terrain. The country boasts one of the most highly developed welfare systems in the world.

Agriculture and fisheries

Less than 5 percent of Norway's total land area is used for agriculture, which is largely confined to small coastal areas in the south. Of that, nearly half provides pasture for cattle, sheep and pigs; the rest is used to grow cereals and potatoes, along with animal fodder. The fragmented nature of the terrain, dissected by rocky outcrops, streams and rivers, means that most farm holdings are very small. In summer, livestock farmers move their sheep and cattle to upland pastures.

About one-third of the land area is productive forest, and it is forestry that provides the main income of many inland farms. Fishing, especially on the north coast, chiefly for cod and herring, is one of the country's major earners. Both are vital industries and they are heavily subsidized by the government for the extra employment they create in rural areas. They also have important associated industries such as fishmeal and oil extraction, and timber and woodpulp products. Fish farming in the fjords along the coast is an increasingly lucrative industry.

Ski jumping (*above*) at Holmenkollen, the biggest of Norway's many ski festivals. Norwegians excel at crosscountry skiing, which developed as a means of traveling across frozen terrain, but alpine events are very popular as well.

Oil-led economy (*below*) A huge drilling rig under construction. The discovery of rich oil and gas reserves in the North Sea in the 1960s gave an enormous boost to Norway's economy, and energy products now form its single largest export.

Industry and trade

Metallic ores – including iron ore, copper, titanium, nickel and zinc – are the only substantial mineral resources on the Norwegian mainland. Iron ore was mined extensively in the past both for export and local smelting, and until recently iron and steel production were the most important industries. However, iron ore is no longer mined in Norway, and aluminum production, from imported bauxite, is now more important. Norway is still a leading exporter of nickel, copper and zinc.

In the past Norway's energy resources were limited to small quantities of coal mined on the Svalbard Islands, and to the country's vast timber resources. However, during the 1970s, western Europe's largest known deposits of oil and natural gas were found in the Norwegian sector of the North Sea. As a result, Norway became a significant exporter of oil and gas. Shipbuilding companies turned to making rigs and equipment for offshore oil extraction, but other industries – for example, the manufacture of machinery, electrical equipment and electronics, and the forestry industries – suffered from lack of investment. The economy became heavily dependent on oil and gas, and was hit very hard by the international fall in prices in the late 1970s. Today much of the country's energy is derived from the harnessing of its many fast-flowing rivers to produce hydroelectricity.

The Norwegian tradition of seafaring made its merchant fleet one of the world's largest. Although the fleet has been declining in size since the mid 1970s, it still makes a significant contribution to Norway's balance-of-payments. Trade has been affected by the country's decision not to join the European Community, but free-trade agreements with Europe have been concluded and closer relations are under continuing negotiation.

Tourism is also important; visitors are attracted all year round by the spectacular scenery and by the excellent opportunities for outdoor sports.

Transportation and communications

In many areas of Norway, coastal shipping is still the main means of communication. Only recently, and with heavy subsidies, has overland transportation offered serious competition, and even the land routes rely on ferries in the fjord regions. The rail network operates mostly in the south of the country, linking Oslo with Stavanger and Bergen. A line extends to Trondheim, but the rail link to

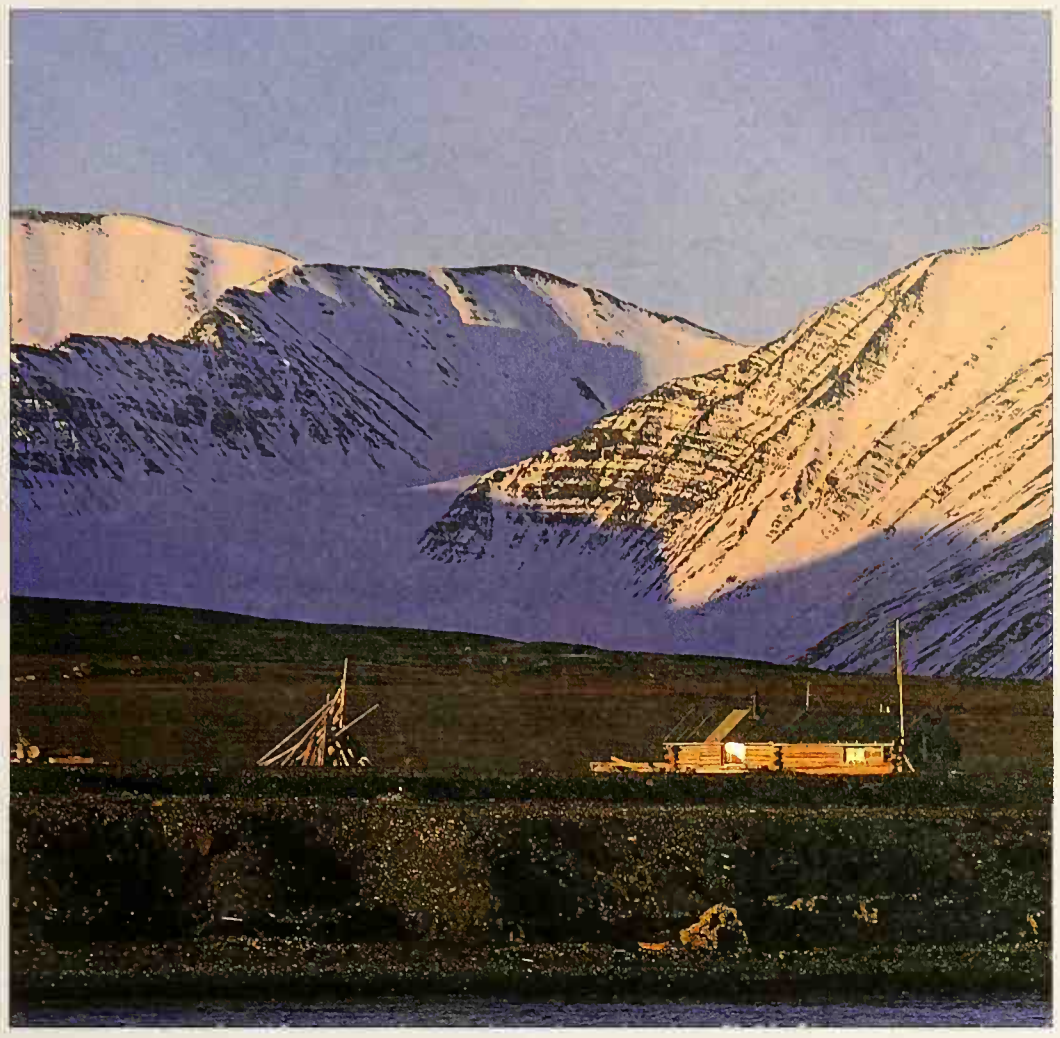
Narvik in the north is through Sweden. About two-thirds of the extensive road system is surfaced and automobile ownership is rapidly increasing. Bus transportation (with linked fjord ferry services) is important in rural areas. Internal air travel is also growing, serving over 40 local airfields. International airports are at Oslo, Stavanger and Bergen. Norway is a partner in the Scandinavian Airlines System (SAS).

There are some 165 newspapers, and broadcasting is controlled by an independent national body with two radio networks and one television network.

Health and welfare

The Norwegian welfare state offers compulsory national insurance for health care (mostly hospital-based) and a comprehensive pension system.

Education is mostly state-assisted and is compulsory for nine years, with an optional tenth year, often vocational. Further secondary and higher education is available at vocational schools, colleges or at one of Norway's four universities.



A trapper's cabin in the Svalbard Islands. Most of the islands' 3,000 residents are Russian and Norwegian coal miners who live there only during the short summer months.

Norway's Arctic island territories

Svalbard is the name given to a group of Arctic islands due north of mainland Norway between latitude 74° and 81° north, and between longitude 10° and 35° east; it was recognized as a Norwegian possession by international treaty in 1920, and contains the Spitsbergen group of islands as well as White Island, King Charles Land, and the southerly Bear Island. The name "Svalbard" means "the cold coast" – in winter temperatures can fall as low as −40°C (−40°F), and gale force winds and pack ice floes almost completely cut the islands off from each other.

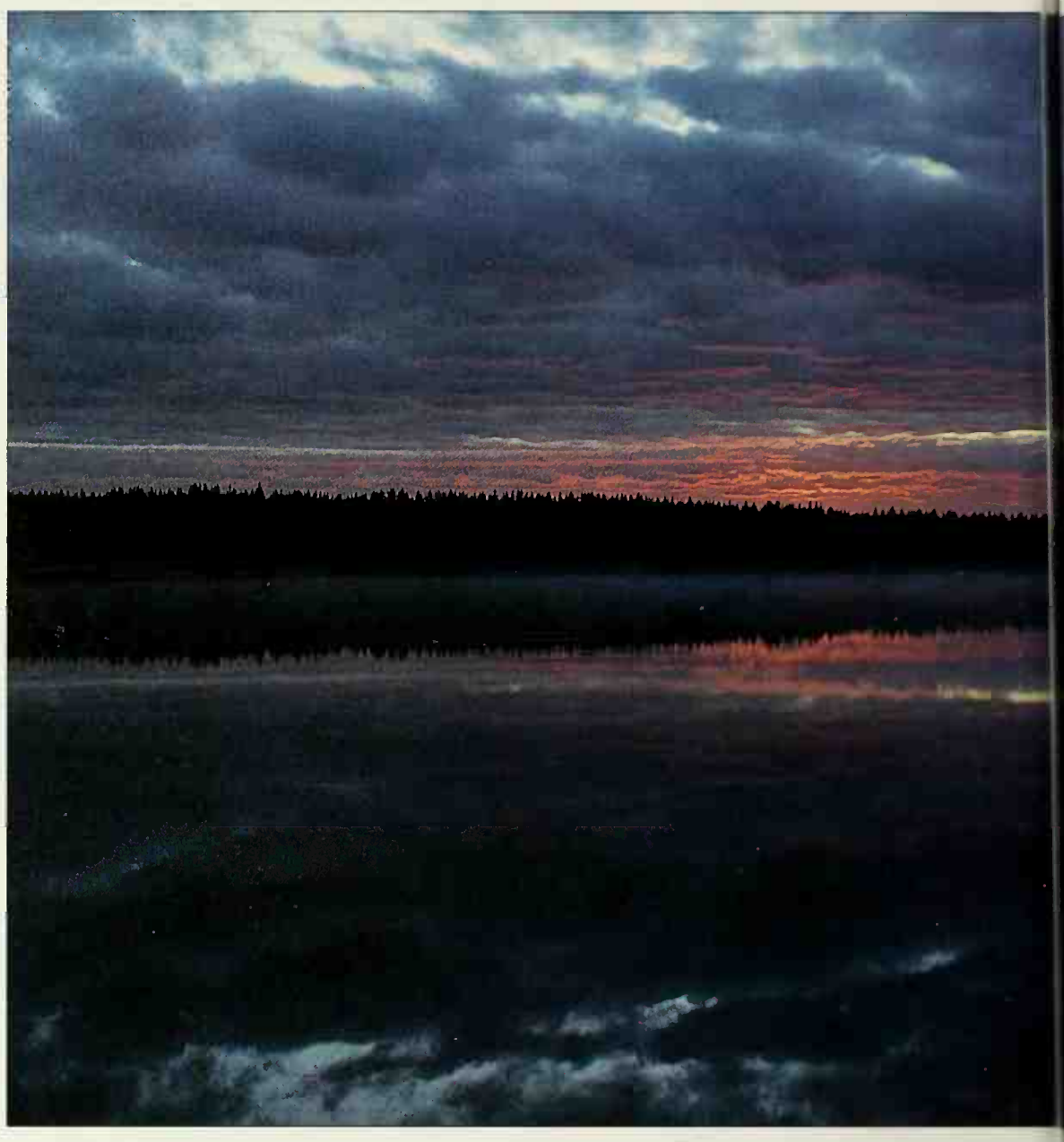
Well known to the Vikings, the islands were only rediscovered in 1596. At first they were a center for whaling, and later for hunting and trapping. Since 1773 they have been used as a base for explorations to the North Pole. But it was the discovery of coal in the early 20th century that brought the islands to international prominence. The 1920 treaty that recognized Norwegian sovereignty over the islands shared mineral rights between several of the signatory nations, but by the 1990s only Norway and Russia continued to mine coal there. Mining, the main activity on the islands, takes place in summer when the population increases to 3,000. The extreme winter weather conditions mean that the population is entirely seasonal; few if any would wish to stay permanently. In the brief summer months, however, the North Atlantic Drift can raise the temperature to 15°C (59°F).

Vegetation consists of very hardy mosses, lichens, trees and shrubs. Many migratory birds use the islands as a rest stop on their seasonal flights – bird-watching and related tourism is becoming a major industry. Seals, walruses and whales breed and live off the coasts of the island group.

Jan Mayen island off the northeast coast of Greenland is named after a 17th-century Dutch seafarer. A bleak volcanic island, it is dominated by the extinct volcano Beerenberg. Annexed by Norway in 1929, it is used as a radio and navigational station, but apart from station personnel is uninhabited and supports scant wildlife.

Sweden

KINGDOM OF SWEDEN



SWEDEN IS THE FOURTH LARGEST COUNTRY in Europe, occupying the southeastern part of the Scandinavian peninsula. Its people enjoy a very high standard of living, a highly developed welfare system and one of the highest average incomes in the world. In the 20th century the country has always taken a strongly independent approach to world affairs.

ENVIRONMENT

Sweden can be divided into two parts. The mountains and plateaus of the north account for two-thirds of the land area; they are thickly forested and rich in mineral resources. The southern lowlands contain four-fifths of the population, most of the agricultural land and the majority of the manufacturing industries.

The land

The mountainous Norrland region in the north and center of the country includes the Kjolen range along the Norwegian border and the Kebnekaise, Sweden's highest mountain peak at 2,111 m (6,926 ft). A series of plateaus, the source of most of Sweden's largest rivers, drops gently away southeastward toward the coastal plains along the Gulf of Bothnia.

Farther south is Svealand, a lowland area with many lakes – including the country's largest, Lake Vänern. Lakes are a major feature of the country, covering almost one-twelfth of the total area. The Göta is the only major river in the south, flowing southwest from Lake Vänern to the North Sea at Göteborg. Eastward the lowland area extends to the Baltic, with Uppsala and the capital city Stockholm near its western edge. The Baltic coastline is rocky and there are numerous small islands lying just off the coast.

South of the lakes, in Småland, the land rises again to 300 m (1,000 ft) above sea level before dropping to the densely populated Skåne plain at the southern tip of the country.

Climate

Almost 15 percent of Sweden's land area lies within the Arctic Circle, while its southern tip is on the same latitude as Copenhagen, Denmark. This long north–south extent gives the country a varied climate. Southwestern Sweden benefits from the warm winds associated with the North Atlantic Drift. These bring mild, wet winters and cool summers. The north and east, areas affected by cold air masses from Siberia, are significantly cooler than the south. The northern Baltic is usually icebound throughout the winter.

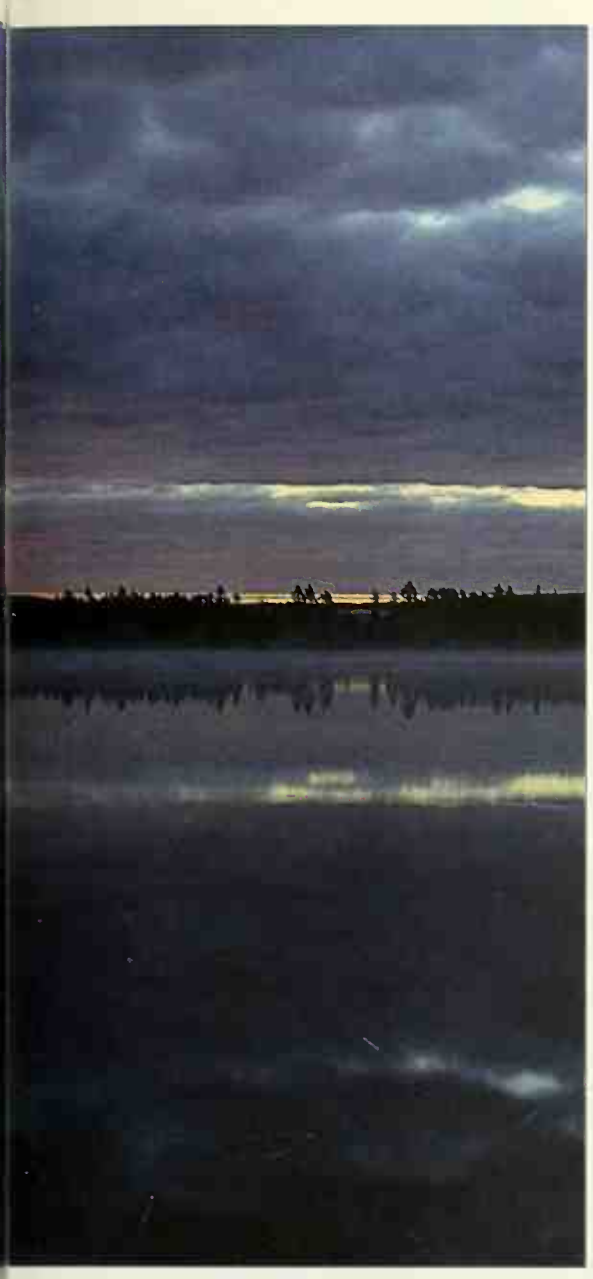
Differences in altitude also have a marked effect. In the Kjolen range snow can lie for as long as eight months, but in the lowlands groundsnow lasts for a month or less.

Plants and animals

Vegetation, like climate, is affected by latitude and altitude. The plains of Skåne and the southwest are characterized by woodlands of beech, oak and hornbeam. Farther north and at higher elevation these give way to pine and spruce. The plateaus of Norrland and Småland support much of the coniferous forests that cover almost 60 percent of the country. On the mountains – from 900 m (3,000 ft) in the south and 500 m (1,600 ft) in the north – the vegetation becomes alpine. Mosses and lichens predominate on the highest ground, birch and dwarf shrubs grow lower down.

Northern Norrland (Swedish Lapland) is the only area that preserves Sweden's ancient forests. Many of the country's remaining trees have been planted by forest farmers: three-quarters of Sweden's forests are controlled by corporations and private owners.

Bears and lynx, once common, are now restricted to the forests of the north. Like the increasingly rare wolf they are protected species. There are no wild reindeer, though in the north the Sami (Lapps) keep herds of domesticated rein-



Northern twilight (*left*) A pink sunset glows over one of the numerous lakes in central Sweden. The country's landscapes of undulating granite plateaus, ice-scoured lakes and dark coniferous forests provided the setting for Sweden's rich legacy of ancient myths and legends

In need of protection (*right*) The Brown bear of Sweden, once common, is now a protected species, living among Sweden's million hectares of protected nature reserves. Sweden's first national parks were established in 1909 – among the earliest in Europe. Many are located in remote mountainous areas, free from public intrusion.

deer. Many other common species are hunted for sport, notably the abundant elk and the Roe deer, common in central and southern areas. Other game animals include foxes, hares and otters.

Sweden is rich in bird life, with gulls, terns and eider ducks on the coast, birds of prey in the forests and cranes in northern marshlands. Golden eagles and cranes are protected by law. There are no poisonous snakes other than the viper, and freshwater and marine fish are plentiful. However, in 1988 sea pollution along the west coast caused largescale destruction of marine fish stocks. The population of Harbor seals in Sweden has also been greatly reduced by a lethal virus infection, which quickly spread to other colonies as far away as the Netherlands, Germany and the British Isles.

SOCIETY

Sweden's political, social and cultural history is closely linked to the other countries of Scandinavia. Since World War II, Sweden's predominately socialist governments have provided ample welfare provisions for its citizens.

History

The early history of Sweden, apart from legends and mythology, is not well documented, but even before the Viking age (9th to 11th centuries) Swedish chieftains had exerted overlordship around the Baltic and beyond. Their Viking descendants opened up trade routes along rivers across Europe to Byzantium (modern Istanbul) and Baghdad, and established new centers of power in Russia. Christianity fared badly in this strongly pagan society, and the church was not established until King Olof Skötkonung (d. 1022) was baptized in the 11th century.

A period of instability and civil war came to an end in the mid 13th century, but the struggle for power between Sweden's nobles and kings continued into the 14th century. Then, in 1397, Erik of Pomerania (c. 1381–1459) was crowned king of Norway, Denmark and Sweden at Kalmar, in southwestern Sweden. The Kalmar Union sought to counter the might of the Hanseatic League, a confederation of north German towns and merchants. This tripartite union was short-lived; the Swedes effectively left it in 1448 by electing their own king, Karl Knutsson (1408–70). Danish efforts to regain control ended in 1523, when Gustav I Vasa (1496–1560) established a new royal dynasty in Sweden that lasted until 1720. Its most notable member was Gustav II Adolf (1594–1632), a skilled military leader who played a decisive role in the religious and political conflicts of the Thirty Years War (1620–48) in Germany, leading the Protestant forces in an overwhelming victory over the Roman Catholic army at Breitenfeld in 1631.

In the long term this was an expensive triumph, demanding a continuous Swedish presence in Germany and the Baltic. In 1700 Charles XII (1682–1718) gained a string of initial victories against the united armies of Denmark, Poland and Russia in the Great Northern War. However, after 1709 the fortunes of war went against Sweden and the country continuously lost territorial possessions. Charles was killed at the siege of Frederiksten, and three years later in 1721 Sweden ceded its Baltic provinces, part of Karelia and the city of Vyborg (near St Petersburg) to Tsar Peter the Great (1672–1725) of Russia.

Parliamentary power became stronger after Charles's death, but a second war

NATIONAL DATA

Land area 449,964 sq km (173,732 sq mi)

Climate	Altitude m (ft)	Temperatures January °C(°F)	July °C(°F)	Annual precipitation mm (in)
Stockholm	11 (36)	−3 (27)	18 (64)	555 (21.9)

Major physical features highest point: Kebnekaise 2,111 m (6,926 ft); longest river: Göta–Klar 720 km (477 mi); largest lake: Lake Vänern 5,390 sq km (2,080 sq mi)

Population (1990) 8,444,000

Form of government multiparty constitutional monarchy with one legislative house

Armed forces army 44,500; navy 12,000; air force 8,000

Largest cities Stockholm (capital – 1,471,000); Göteborg (720,000); Malmö (466,000)

Official language Swedish

Ethnic composition Swedish 90.8%; Finnish 3.1%; others 6.1%

Official religion Lutheranism

Religious affiliations Lutheran 88.9% (nonpracticing 30.0%); Roman Catholic 1.5%; Pentecostal 1.2%; others 8.4%

Currency 1 Swedish krona (SKr) = 100 öre

Gross national product (1989) US $184,230 million

Gross domestic product (per person 1990) US $16,000

Life expectancy at birth male 74.2 yr; female 80.0 yr

Major resources agriculture/fisheries 3.1% GNP; mining 0.4% GNP; manufacturing 24.0% GNP: trade 11.9% GNP; finance 20.8% GNP; public administration/defense/services 26.7% GNP

with Russia (1741–43) left Finland, then a duchy of Sweden, occupied by Russian troops, while war with Prussia (1757–62), the rising power in northern Germany, put a heavy strain on the country's finances. Gustav III (1746–92) restored absolute rule and attempted major social reforms. His efforts to regain the Finnish provinces were foiled by treason in 1788, and four years later he was assassinated.

During the Napoleonic wars at the beginning of the 19th century, Sweden aligned itself with Britain, but its ally could offer little support against the combined forces of France, Russia and Denmark. In 1809 Finland and the Åland Islands at the southern end of the Gulf of Bothnia were ceded to Russia, and in 1810 one of the emperor Napoleon's marshals, Jean-Baptiste Bernadotte (1763–1844), was chosen as crown prince, taking the name of Charles John. He failed to negotiate a return of the ceded territories, but in 1813 took a combined Prussian, Russian and Swedish army into Denmark, forcing its king, Frederik VI (1768–1839), to surrender Norway under the Treaty of Kiel in 1814. Shortly afterward, following a brief rebellion, Norway was forced into political union with Sweden.

Liberal reforms in the 19th century included free trade (1846) and a two-chamber parliament (1865-66). In 1905 Oscar II (1829–1907) dissolved the union of the Swedish and Norwegian crowns.

Sweden remained neutral throughout both World Wars. It later joined the United Nations (UN), but stayed outside the North Atlantic Treaty Organization (NATO). From 1946 onward the Social Democratic Party developed a comprehensive welfare system. The murder of prime minister Olof Palme (1927–86) deprived the Social Democrats of their most charismatic and persuasive leader.

Government

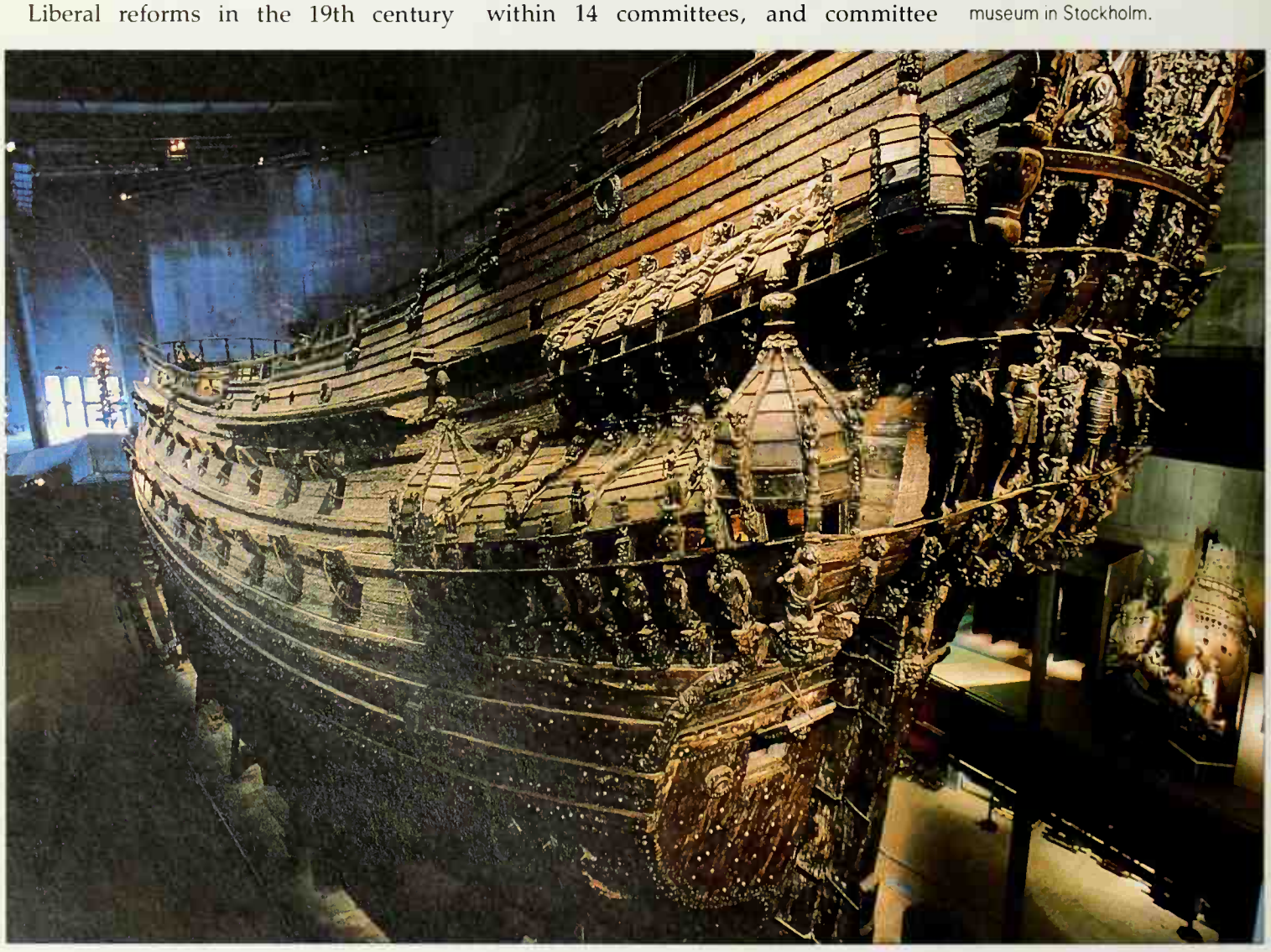
Sweden is a constitutional monarchy, though today the monarch's role is almost entirely ceremonial. The Riksdag or parliament consists of a single chamber with 349 members elected for a three-year term. Everyone aged 18 or over can vote. Some 310 seats are allocated directly, and the rest are divided between parties in order to achieve proportionality with the accumulated votes throughout the country. This proportional representational system is designed to avoid having an overabundance of small or fringe parties.

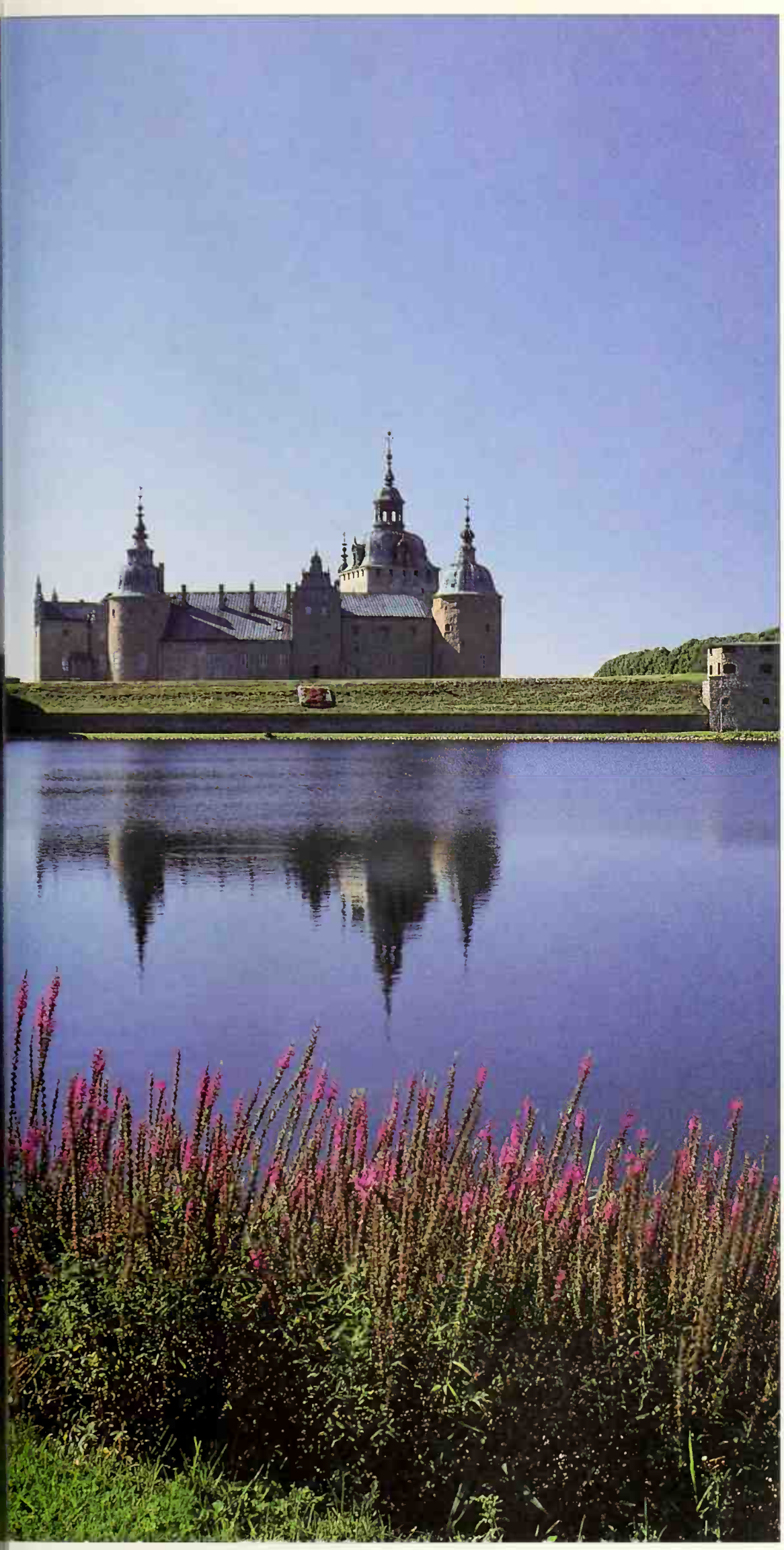
The principal organs of government lie within 14 committees, and committee

Symbol of Nordic political union (*right*) The castle stronghold of the historic city of Kalmar overlooks the narrow straits lying between the mainland and Öland, a long narrow island off the southeast coast. It was here that the Union of Kalmar was sealed in 1397 with the coronation of Eric of Pomerania as king of Denmark, Norway and Sweden under the regency of Queen Margrethe of Denmark.

Seasonal festivities (*far right*) Communities in Sweden still celebrate Midsummer's Eve – the longest day – in the traditional way with children dancing around a cross of flower and leaves, and with all-night parties. Candles on St Lucy's day (13 December) light up the winter gloom, and spring is greeted on Walpurgis night (the last day of April) with the lighting of bonfires.

Rescued from a watery grave (*below*) The 64-gun Vasa warship was built for Sweden's King Gustav II Adolf (1594–1632), but sank on its maiden voyage in 1628. Efforts to raise it failed and it settled into the mud of Stockholm's harbor 33.5 m (110 ft) below the surface, where it lay until it was rediscovered in 1956. Five years later the hull was raised intact, along with coins, artifacts, textiles and the skeletons of some of the crew. It is now housed in a museum in Stockholm.





members are elected by proportional representation. Executive control belongs to an 18-member cabinet led by the prime minister, who is appointed by the speaker of the Riksdag and must be approved by its members. The cabinet, or an individual minister, can be dismissed by a simple majority vote in the Riksdag. At local level there are 24 counties (each headed by a governor) and 23 county councils (the island county of Gotland in the Baltic does not have one). There are in addition 284 town councils.

Environmental awareness brought the Green Party enough support to make its first appearance in the Riksdag in 1988. The same year saw agreement with the former Soviet Union over maritime rights in the Baltic. Among other things, this agreement was intended to reduce the number of Soviet submarine incursions into Swedish territorial waters.

People

The people of Sweden share common ethnic and cultural origins. The Swedish language is closely related to Danish, Norwegian, Icelandic and Faeroese, and all belong to the same branch of the Indo-European family of languages as German and English. The most sizable ethnic minority are the Sami (Lapps), who have a distinctive culture and language. However, most Samis also speak Swedish, and in the north both languages are taught in schools. Recent immigration has created other minority groups including Finns, Greeks and Turks.

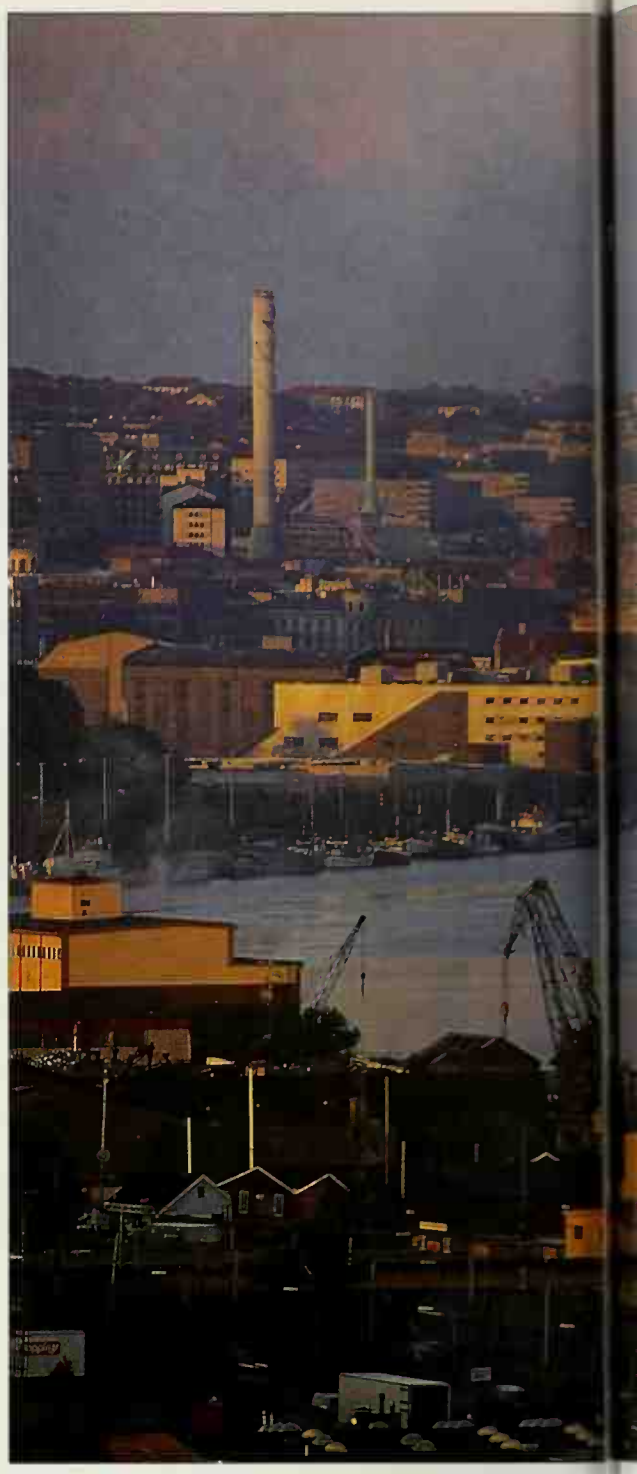
The majority of Swedes belong to the national Lutheran Church, though many are nonpracticing. Its organization and finances are closely linked with the state, but it retains independence in religious matters. Swedish culture is lively and productive, particularly in literature, art, sculpture and film-making.

ECONOMY

The prime natural resources of Sweden are lumber, iron ore and water, which is harnessed for hydroelectric power. All three are largely confined to Norrland. Forestry and engineering are the chief export earners since the decline of the shipbuilding industry.

Agriculture
The lumber industry is carefully regulated by the government. Some 45 percent of Sweden's total land area is devoted to productive forestry, which yields turpentine, resins, dyes, rayon and plastics as well as traditional timber products such as pulp for paper. The rivers of Norrland supply timber and hydroelectric power to sawmills and pulp mills on the Bothnian coast. From there the finished products are shipped abroad or sent to the industrial south for further processing.

Less than 7 percent of Sweden's land area is farmed, and agriculture is protected by government levies; however, it does meet four-fifths of the domestic requirement. Most cultivated land is in Skåne and the central lowlands, where arable crops include sugar beet, barley and wheat. Elsewhere farms are smaller and livestock (cattle, sheep and pigs) is more important; only hardy varieties of grass for fodder, potatoes, barley and rye can be grown successfully in the north's shorter growing season. Fur-bearing animals such as mink and fox are also raised for their pelts. Increasing mechanization and rationalization of farms is causing a rural exodus. Some 80 percent of the population now live in towns and cities, and farming employs less than 5 percent of the workforce.



The Vikings: founders of Russia?

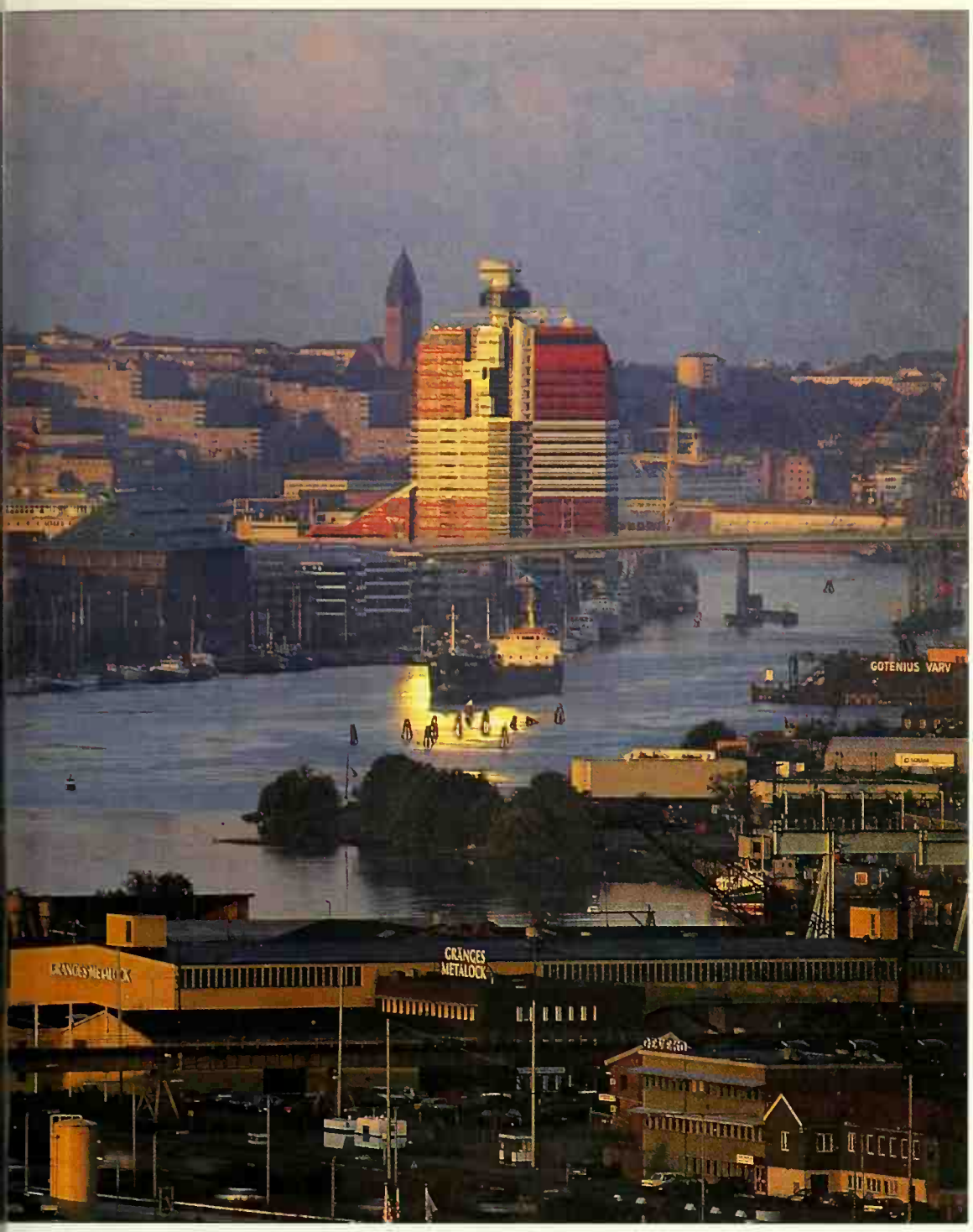
In the 8th century a strong kingdom based around Uppsala in Sweden made the first of many forays into the eastern Baltic. Within 50 years two Swedish settlements had developed in what is now Latvia, with another at Apulia in modern Lithuania. Although these towns were probably established as trading posts, they became the starting point for Viking expansion and conquest farther south.

In the early 9th century dense forest separated the Baltic coast from the Black Sea and Central Asia, which at that time were dominated by two great trading empires. The Arab Caliphate, with its capital at Baghdad, controlled everything south of the Caucasus, including the caravan routes to China and the Far East. The Byzantine empire, with its capital at Constantinople (modern Istanbul), controlled the Black Sea and southeastern Europe. For enterprising and adventurous traders there were two possible routes southward from the Baltic coasts – down the Dnieper river to Constantinople, and down the Volga river to the Caspian Sea and Baghdad. Archaeological and written evidence indicates Swedish Vikings were using both routes by the end of the 9th century.

The Russian Primary Chronicle, also known as the Nestor Chronicle, describes the origins and growth of Russia up to the 12th century. It cites a tradition that the royal families of Novgorod and Kiev were founded by Scandinavians – and there is tangible evidence to support this idea. Archaeologists digging at Staraya Ladoga in northern Russia have found the remains of a Swedish colony. Their excavations have shown that Swedes lived there from the early 9th century to the middle of the 11th. The town was ideally placed for access to both major routes south, and another written source proves the existence of a northern kingdom of "Rus" as early as 839. It also records that these "Rus" although not Swedish were "of Swedish origin". Inscriptions and archaeological finds from Sweden confirm strong links with Kiev and Constantinople, and Scandinavian names began to appear in the Slavic regions throughout the 9th century: Helgi changed to Oleg, Valdemar became Vladimir, Ingvar became Igor and so on.

So was Russia founded by Swedish Vikings? Probably not as such – but the Vikings almost certainly did found a great number of towns in Russia and the Ukraine, including Novgorod, Izborsk, Polotsk, Smolensk, Murom, Rostov, Chernigov and Kiev.

Viking horde A cache, found in an 11th-century burial site in Sweden, consists principally of Byzantine and Islamic coins, and provides striking evidence of the great distances traveled by the Viking adventurers.



Seaport city Göteborg, overlooking the straits between the North and Baltic seas, is Sweden's largest port and second largest city. Its industries include Volvo, textiles and the SKF steel giant. It is also a large freight and passenger ferry center.

Unlike Norway, fishing – mostly from harbors on the west coast – makes a marginal contribution to the economy. The catch is dominated by fish such as herring, mackerel and cod.

Industry and trade

Kiruna in northern Norrland has one of the world's richest deposits of iron ore, and a processing plant has been built at the port of Luleå on the Bothnian coast. Other mineral resources include a range of precious metals as well as copper, zinc, lead and uranium. There are low-quality coal deposits in the south.

Sweden is one of the largest users of hydroelectric power in the world. A series of plants, mostly along the Norrland rivers, provides a large percentage of the country's electricity requirements. Coal and nuclear fuel are imported, along with all of Sweden's oil. In 1988, after the nuclear disaster at Chernobyl in the Ukraine (then part of the Soviet Union), the decision was taken to phase out the country's 12 nuclear power stations, which supplied half of Sweden's energy requirements by 2010.

The manufacturing industry in Sweden benefits from the country's rich resources. Products include electronic and telecommunications hardware as well as transportation equipment and machinery.

Close to half of the country's heavy industrial production is sold abroad, making the economy increasingly dependent on foreign trade. Sweden has been a full member of the European Free Trade Association (EFTA) since 1960, and has a free trade agreement (1984) with the European Community.

Transportation and communications

State involvement in transportation and communications is quite high. The trucking industry, dominated by two government-run companies, is the chief goods carrier. Buses are the backbone of most local public transportation services. Air services are dominated by the Scandinavian Airlines System (SAS), a joint venture of the Danish, Norwegian and Swedish governments.

Since the railroads were built in the 19th century internal shipping services have declined in importance, though international shipping traffic remains very active. Recently the state-owned railroads have also suffered low profits and shutdowns. Most people now travel in cars, increasing demand for improved roads.

There are 186 daily newspapers, but many of them are state-subsidized and the number has been falling steadily since World War II. Sveriges Radio operates a comprehensive radio network and two television channels.

Health and welfare

Health insurance is compulsory and comprehensive. The government provides virtually everyone with child allowances, pensions for old age and disability, and benefits for sickness, maternity and unemployment. Medicines, doctors' fees and hospital charges are largely paid for by the state. As a result, both direct and indirect taxation is very high. Postwar governments have always been committed to full employment. In the 1980s unemployment figures were lower than in neighboring European countries.

Education

Sweden has a completely unified education system that coordinates university and vocational studies with secondary-school programs. Everyone has to attend comprehensive schools between the ages of 7 and 16, and special provision is made for the disabled. English is taught from the third year on, and German or French can also be selected in later years. In the seventh year pupils choose their own subject groups.

Everyone is entitled to continue their studies after leaving school, to prepare for university or for vocational training. There are 13 universities, of which the oldest is Uppsala (founded 1477). Adult education is available through daytime and evening classes, or at the folk high schools. Distance or home learning is available with support from radio, television or correspondence courses.

Finland

REPUBLIC OF FINLAND

FINLAND'S CULTURE AND LANGUAGE ARE quite distinct from those of the other Nordic Countries. For long periods of its history it was ruled by Sweden and Russia, but neither was able to subdue the Finnish spirit.

ENVIRONMENT

Finland is the sixth largest country in Europe and one of the most northerly. Its climate and topography reflect the fact that one-third of the country's area lies within the Arctic Circle.

NATIONAL DATA

Land area 338,145 sq km (130,559 sq mi)

Climate	Altitude m (ft)	Temperatures January °C(°F)	July °C(°F)	Annual precipitation mm (in)
Helsinki	58 (190)	−7 (19)	17 (63)	641 (25.2)

Major physical features highest point: Haltiatunturi (northern Finland) 1,328 m (4,357 ft); longest river: Kemi 483 km (300 mi); largest lake: Lake Saimaa 4,400 sq km (1,700 sq mi)

Population (1990) 4,975,000

Form of government multiparty republic with one legislative house

Armed forces army 27,800; navy 1,400; air force 1,800

Largest cities Helsinki (capital – 994,000); Turku (265,000); Tampere (261,000)

Official languages Finnish, Swedish

Ethnic composition Finnish 93.6%; Swedish 6.0%; others 0.4%

Official religion none

Religious affiliations Lutheran 88.7%; Finnish (Greek) Orthodox 1.1%; unaffiliated 9.3%; others 0.9%

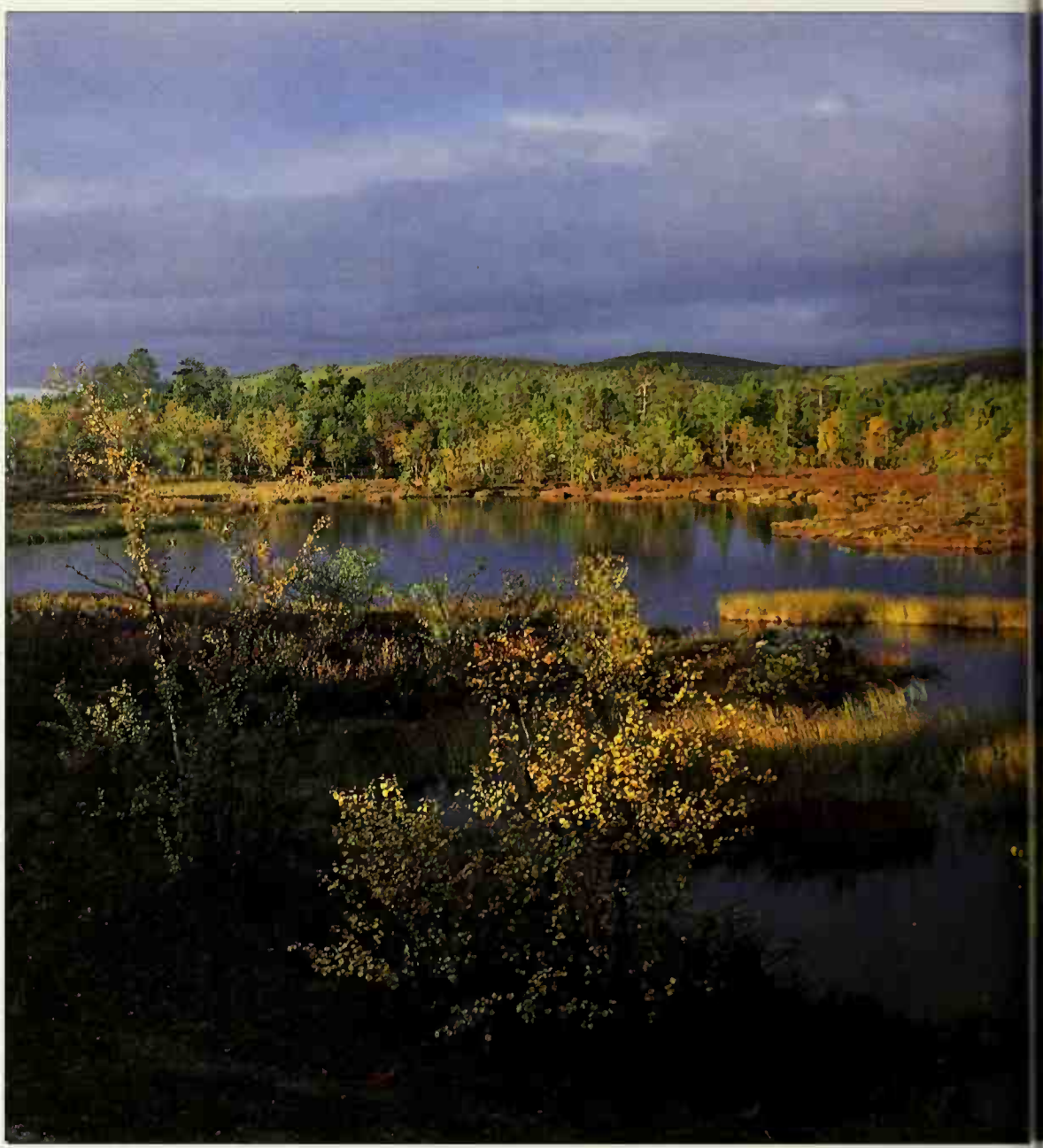
Currency 1 markka (Fmk) = 100 pennia

Gross national product (1989) US $109,705 million

Gross domestic product (per person 1990) US $15,620

Life expectancy at birth male 70.7 yr; female 78.7 yr

Major resources agriculture/fisheries 5.8%; mining/manufacturing 22.2% GNP; trade 9.3% GNP; finance/services 22.9% GNP; public admin/defense 14.2% GNP



"Land of lakes and marshes" is the literal meaning of Suomi, the name the Finns give their country, and this view of the Lapland landscape in summer shows how well it fits the description. Birch trees flourish on the peaty soils of this part of the country.

The land

Finland is landlocked to the north and east; to the south lies the Gulf of Finland and to the west the Gulf of Bothnia. The Åland Islands, lying at the entrance to the Gulf a few miles off the southwestern coast of Finland, are an extension of the coastal lowland. Some 80 of the 3,000 islands in the archipelago are inhabited.

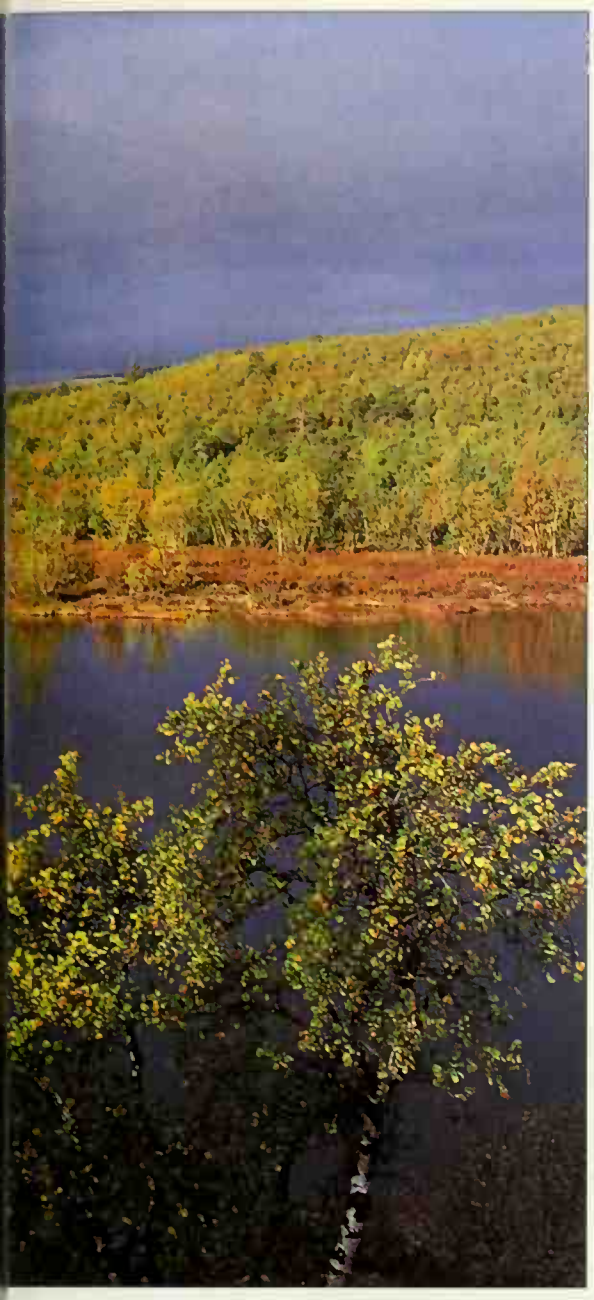
Apart from a small hilly area in the northwest, Finland is lowlying, its ancient granite rocks ground down by the glacial icesheets. The ice remained until only a few thousand years ago, leaving an undulating landscape dotted with lakes. The Finnish name for the country, Suomi, means "land of lakes and marshes". There are over 60,000 lakes covering at least one-tenth of its area, and they are linked by extensive river systems. Lake Saimaa, the largest, covers 4,400 sq km (1,700 sq mi). Most of the lakes, however, extend no more than 25 sq km (10 sq mi). The longest rivers are the Kemi and the Oulu, both of which drain west into the northern end of the Gulf of Bothnia.

Climate

Separated from the Atlantic by the Scandinavian peninsula, Finland's climate is influenced by the continental weather system. Above the Arctic Circle the weather is typically extreme; very cold winters are matched by short summers in which temperatures often soar during the long days. Farther south the climate is moderated by the proximity of the sea. The mild summers allow Finland's agricultural area to extend farther north than in the other Nordic countries. However, from mid November until April the whole country is snow-covered and the sea is frozen over.

Plants and animals

Most of the country is heavily forested, chiefly with pine, spruce and other conifers. Hardy broadleaf trees grow in the south. In the extreme north the forests give way to swampy tundra, a landscape of few trees but rich in lichens and berry-



producing plants, especially cloudberries.

The woodlands are home to many mammal species, including bears, wolves and lynx; elk and reindeer are relatively common. The rivers are rich in salmon and trout, and they also support ducks and other waterfowl.

As elsewhere in the Nordic Countries, the forests, lakes and rivers show signs of environmental damage from acid rain, caused by windblown air pollution originating outside the region. In addition, radiation from the Chernobyl nuclear disaster in the Ukraine in 1986 still affects Sami (Lapp) reindeer herds.

SOCIETY

Although Finland has been independent only since the early 20th century, its people retain a proud and enduring sense of national identity.

History

Finland was first inhabited by neolithic nomadic hunter–gatherers, probably ancestors of the present-day Sami. Later settlers came from around the Baltic area, speaking a Finno-Ugaric language that is closely related to both Estonian and Lithuanian but is completely unrelated to the Scandinavian languages, which are Indo-European in origin.

Finland remained outside the cultural orbit of Europe until the 12th century, when the Swedish kings launched a crusade to subdue and convert its pagan inhabitants. The Swedes' English-born bishop, Henry, murdered by a Finnish peasant, later became Finland's patron saint. Between the 13th and 19th centuries Finland was effectively a territory of Sweden, and its culture and education were entirely Swedish-dominated. Swedish became the language of government and the aristocracy.

Russia, however, continually eroded parts of Finnish territory, and in 1809, when Sweden failed to defend Finland, the Finns accepted an offer by Tsar Alexander I (1777–1825) to make the country an autonomous grand duchy. Finland enjoyed considerable political freedom, and prospered under the favorable rule of Alexander II (1818–81). He encouraged wider use of Finnish, which had survived only as the language of the working people; this was partly to weaken links with Sweden, and partly to foster a sense of nationalism and new belief in a Finnish cultural identity. Harsh moves by his successor, Nicholas II (1868–1918), to Russify the country only encouraged a growing nationalist movement that successfully united all levels of society.

At the outbreak of the Russian revolution (1917–18) Finland seized the opportunity to declare its independence; a communist coup was defeated and a republic established in 1919. The Åland islanders in 1917 sought to become part of Sweden, with which they had long economic and cultural links dating back to the 12th century. Finland granted them autonomy in 1920, but refused to allow them to secede; today they remain an autonomous part of the state of Finland.

In 1939 the Soviet Union took advantage of its pact with Nazi Germany to seize much of Karelia in eastern Finland. With the Allies unable to help, Finland had to turn to Germany, for which the Soviet Union imposed heavy postwar reparations. During the Cold War era Finland managed to steer a delicate course, maintaining its democratic tradition and mixed economy without offending the Soviet Union. The term "Finlandization" came to describe the situation of a small, neutral country coexisting beside a communist superpower.

Government

Since 1919, Finland's president has been selected by an electoral college chosen by popular vote, though there are now provisions for direct elections. The president appoints the administration, the prime minister and cabinet. Legislative authority is vested in a single-chamber parliament, the Eduskunta. The autonomous province of the Åland Islands has its own elected congress and land councillor, or prime minister, but the provincial governor, appointed by the Finnish government, has the right to veto the decisions made by congress.

Proportional representation in Finland has allowed a mass of major and minor parties to develop, and most governments are center-left coalitions. The largest parties are the Social Democrats, the Center Party and the National Coalition Party; the once-popular Communist Party has suffered from declining membership.

People

Finland is more linguistically complex than the other Nordic Countries. In most of the country the Finnish-speaking majority is dominant, including regional groups with their own dialects, such as the Tavastlanders. Most of the country's Sami inhabitants, who speak their own distinct language and now number only about 2,500, live as seminomadic reindeer herders in the north. In the coastal south and the Åland Islands there is a Swedish-speaking minority. Swedish is still an official language alongside Finnish, but is in declining use.

The Lutheran Church is the national church, to which about 90 percent of the population belong. A tiny proportion (about 1 percent) belong to the Finnish Orthodox church.

Finland's international cultural contribution belies its size and its linguistic isolation. The arts, particularly the music of Jean Sibelius (1865–1957) and the folk-epic *Kalevala* compiled by Elias Lönnrot (1802–84), played an important part in establishing Finland's distinctive identity and, latterly, its nationhood. In the field of town-planning, the architects Alvar Aalto (1898–1976) and Eliel and Eero Saarinen (1873–1950 and 1910–61) have been influential in shaping the modern cityscape. Finnish design skills have become world-famous, particularly in glasswork and the bright Marimekko fabrics. Also internationally famous, particularly with younger readers, are the novels of Tove Jansson (b. 1914) about the Moomintroll family and their adventures.

ECONOMY

Finland enjoys its share of the Nordic Countries' prosperity, and its national income is currently growing at a much faster rate than its population.

Agriculture and forestry

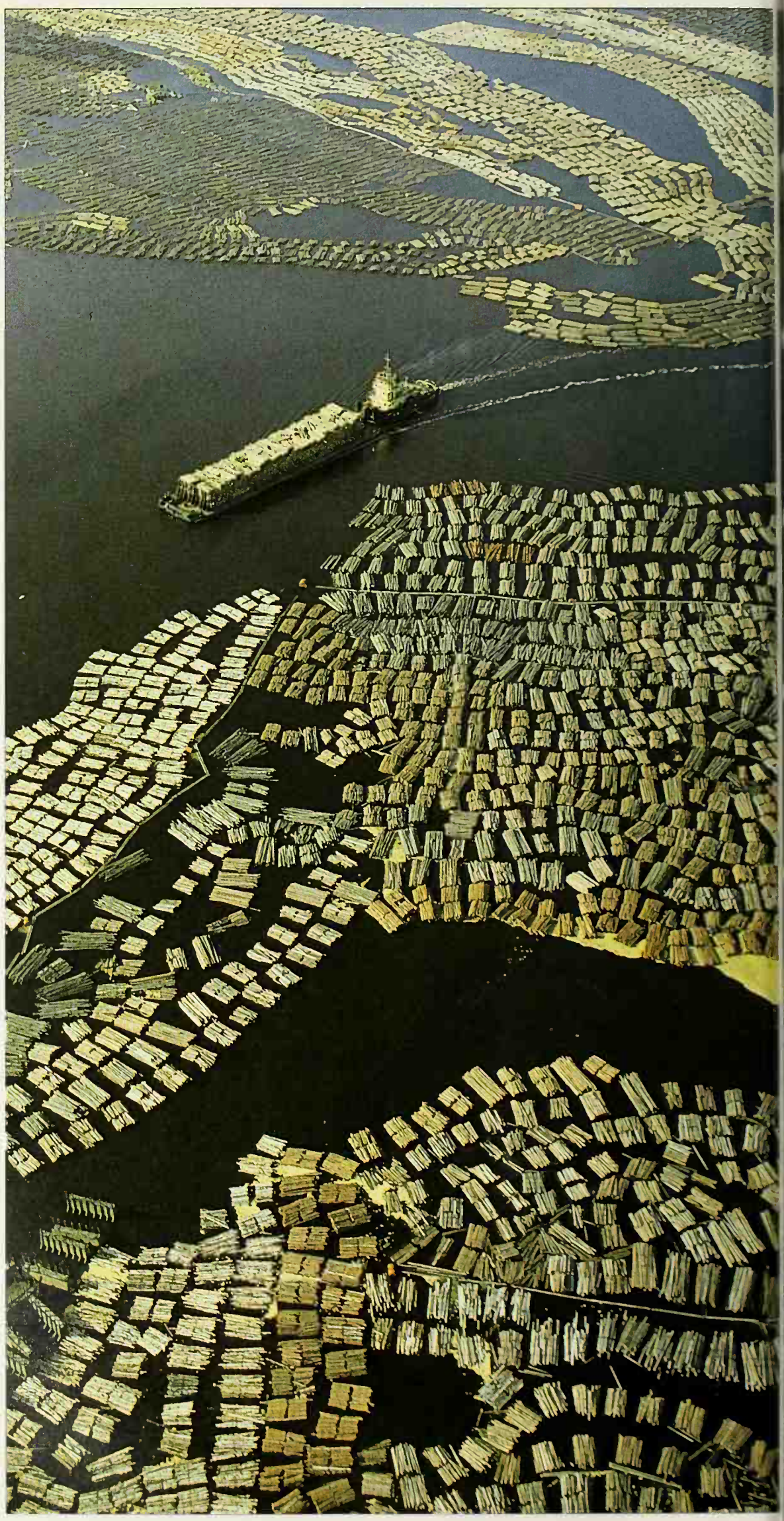
Timber is Finland's main natural resource, and the country's forestry and lumber industries are among the most important in Europe. Agriculture is confined to the south by climate; only about 9 percent of the land is cultivated. Most farmers own smallholdings and combine agriculture with forestry. Cereals are grown, mainly as fodder, with potatoes and sugar beet and, in the extreme south, rapeseed and some fruit. Livestock production traditionally concentrated on the raising of dairy cattle, but this has declined significantly; there is also some pig and poultry farming.

Industry

Industry – primarily manufacturing – accounts for one-quarter of the country's income. Mining industries are small but significant, including important European supplies of copper, nickel and vanadium, and other rare metals such as zinc, chromium and titanium. Iron ore is no longer mined.

Manufacturing growth after World War II was spurred on both by the Soviet Union's demands for reparations and by favorable trade agreements soon after, whereby Russian oil was exchanged for Finnish manufactured goods. This was a considerable advantage for Finland, as the country was largely dependent on peat for its energy. One-third of the country's energy requirements is derived from hydroelectric plants, and more than one-third from nuclear plants.

Heavy industries include specialized shipbuilding, particularly of icebreakers, and the manufacture of machinery and cement, together with building and construction, chemicals and petroleum refining. Important lighter industries include electronics, textiles, printing and publishing, and all types of timber products, including wood and paper. Tourism is increasingly important. Most major industries have some degree of state ownership or government investment.



Floating assets Forestry is the mainstay of the Finnish economy. The cut logs are floated down the rivers to huge timber mills on the coast. Wood products, including paper, wood pulp, board and plywoods, account for over one-third of exports.

Trade and commerce
Finland is a member of the European Free Trade Association (EFTA) and enjoys a free-trade agreement with the European Community. Timber and related products dominate exports, while petroleum is the major import.

Transportation and communications
The road network is extensive, though only about half the roads are surfaced. The state-owned rail network is extensively developed in the southwest, and is undergoing modernization and electrification elsewhere. Air services operate between various domestic airports all around the country, and internationally via Malmi airport at Helsinki. The inland waterway network of lakes and rivers is an important transportation route for the timber industry, and its scenic beauty also attracts tourists.

Health and welfare
Finland's state welfare system offers a wide range of benefits, including some subsidized housing in the towns to counter an acute national shortage. The population is aging as life expectancy increases under Finland's excellent health service. Elderly people enjoy good pensions and generous care provisions. The nine-year comprehensive education system is free and compulsory.

Finland Awakes!

Perhaps more than any other single person, it was the composer Jean (or Jan) Sibelius who helped to put his struggling new nation on the international map.

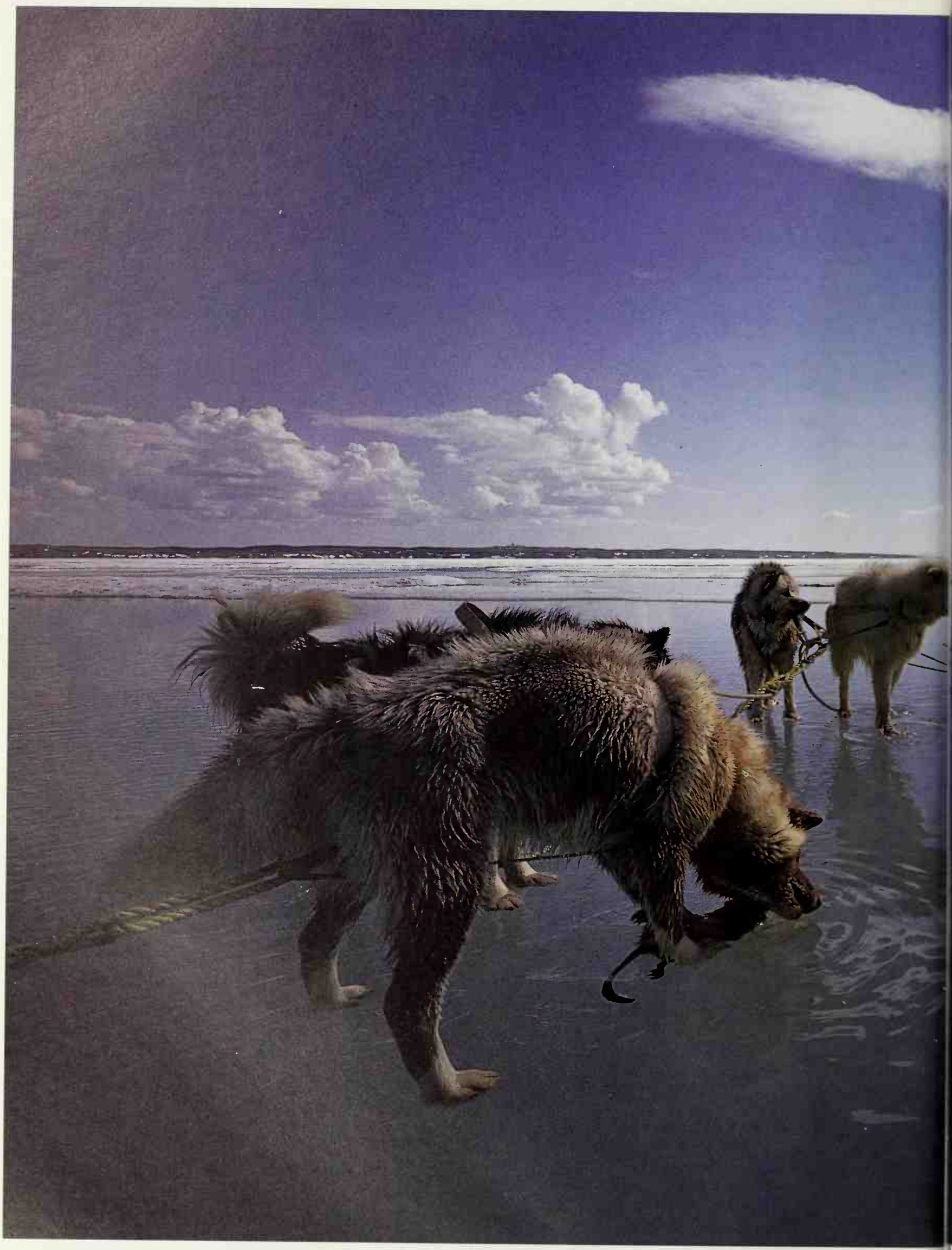
Sibelius was born in 1865 in the small town of Hämeenlinna in the south of Finland. Like most educated Finns at that time, his family were Swedish-speaking, but their forward-looking views led them to Finnicize their Swedish name, Sibbe, and Jean was sent to the Finnish-speaking grammar school. It was there that he first showed unusual talent for the violin, and composed his first piece at the age of 10. He was sent to university in Helsinki to study law, but soon abandoned this for music, going to Berlin and Vienna to study.

His time abroad reinforced his love of Finnish, as did his secret engagement to Aino Järnefelt, daughter of a fervently nationalist aristocratic family. Finnish influences became pervasive in his music. His first major work, the Kullervo Symphony, was a massive choral symphony based on a tragic legend from the *Kalevala* folk epic. First performed in 1892, it won him immediate recognition.

In 1899 Sibelius, by now beginning to establish an international reputation and devoting himself fulltime to composing, wrote the first of his seven symphonies. However, the political upheavals of that year were having an effect on Finnish society. Under Tsar Alexander III (1845–94), Finland had enjoyed freedoms unknown in Russia itself, but following the accession of Nicholas II (1868–1918) a Moscow-appointed governorship was imposed, and Russian was made the legal state language. Major Finnish newspapers were closed down, and protest meetings and political plays were banned. To find a way around the ban a series of allegorical tableaux was put on. Sibelius wrote the music for these tableaux and some of them, including the *Karelia Suite*, became the basis of his most popular works. For the last tableau he wrote *Finland Awakes!* – a strikingly dramatic finale.

Renaming the piece *Finlandia*, Sibelius redrafted the finale as a concert overture for the Helsinki Orchestra to play at the Paris World Fair in 1900, where Finland was given a pavilion of its own on a par with other countries. It is from this World Fair that Finland usually dates its acceptance as a nation among nations. The pavilion, designed by Finnish architects including the young Eliel Saarinen, and filled with original Finnish works of art and design, made an immense impression, as did *Finlandia*. Soon the piece was being played all over the world. Even today *Finlandia* is considered the country's unofficial national anthem.

Monument to a national hero The Sibelius monument in Helsinki honors the composer whose music captured the growing sense of Finnish identity. His *Finlandia* overture was performed in 1900, 17 years before Finnish independence.



Recreation at the Arctic Circle. Two Sami (Lapp) men prepare for a dogsled race across the ice. This traditional pastime is still enjoyed, though snowmobiles are now the primary means of winter transport.

Denmark

KINGDOM OF DENMARK

DENMARK, LYING AT THE ENTRANCE TO THE Baltic Sea, is one of Europe's smallest countries. It has two self-governing dependencies, Greenland and the Faeroe Islands. The country provides a remarkable cradle-to-grave welfare program for its people, who enjoy possibly the highest standard of living in the European Community. Until recently it also had the highest level of income tax and the greatest foreign debt of any EC country.

NATIONAL DATA

Land area 43,093 sq km (16,638 sq mi)

Climate	Altitude m (ft)	Temperatures January °C(°F)	July °C(°F)	Annual precipitation mm (in)
Copenhagen	9 (30)	1 (33)	17 (63)	571 (22.5)

Major physical features highest point: Yding Skouhøj (central Jutland) 173 m (568 ft); largest island: Sjaelland 7,104 sq km (2,708 sq mi)

Population (1990) 5,143,000

Form of government multiparty constitutional monarchy with one legislative house

Armed forces army 19,400; navy 5,400; air force 6,900

Largest cities Copenhagen (capital – 1,339,000); Århus (258,000); Odense (174,000); Ålborg (155,000)

Official language Danish

Ethnic composition Danish 97.2%; Turkish 0.5%; other Scandinavians 0.4%; others 1.9%

Official religion Lutheranism

Religious affiliations Lutheran 90.6%; Roman Catholic 0.5%; Jewish 0.1%; others 8.8%

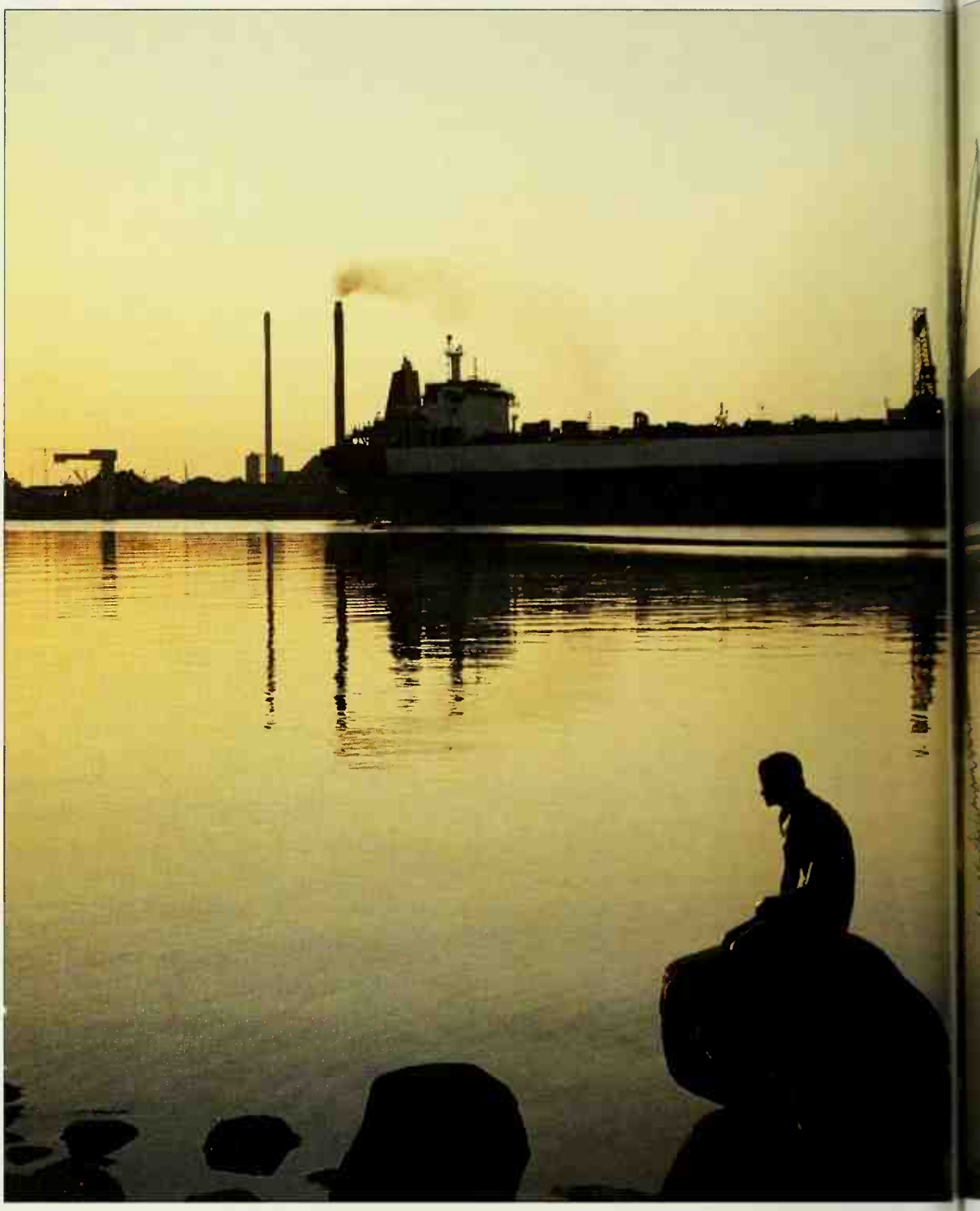
Currency 1 Danish krone (DKr) = 100 øre

Gross national product (1989) US $105,263 million

Gross domestic product (per person 1990) US $15,380

Life expectancy at birth male 73.0 yr; female 78.0 yr

Major resources agriculture/fisheries 4.5% GNP; mining 0.5% GNP; manufacturing 20.3% GNP; trade 13.8% GNP; finance 19.0% GNP; public administration/defense 23.2% GNP



ENVIRONMENT

Mainland Denmark, the Jutland peninsula, extends 300 km (200 mi) northward from the country's border with Germany. To the west of the peninsula, a series of dunes, lagoons and sandbars shelters the coast from North Sea storms. To the east, fertile plains face toward the Baltic, and to an archipelago of 483 islands, of which 97 are inhabited.

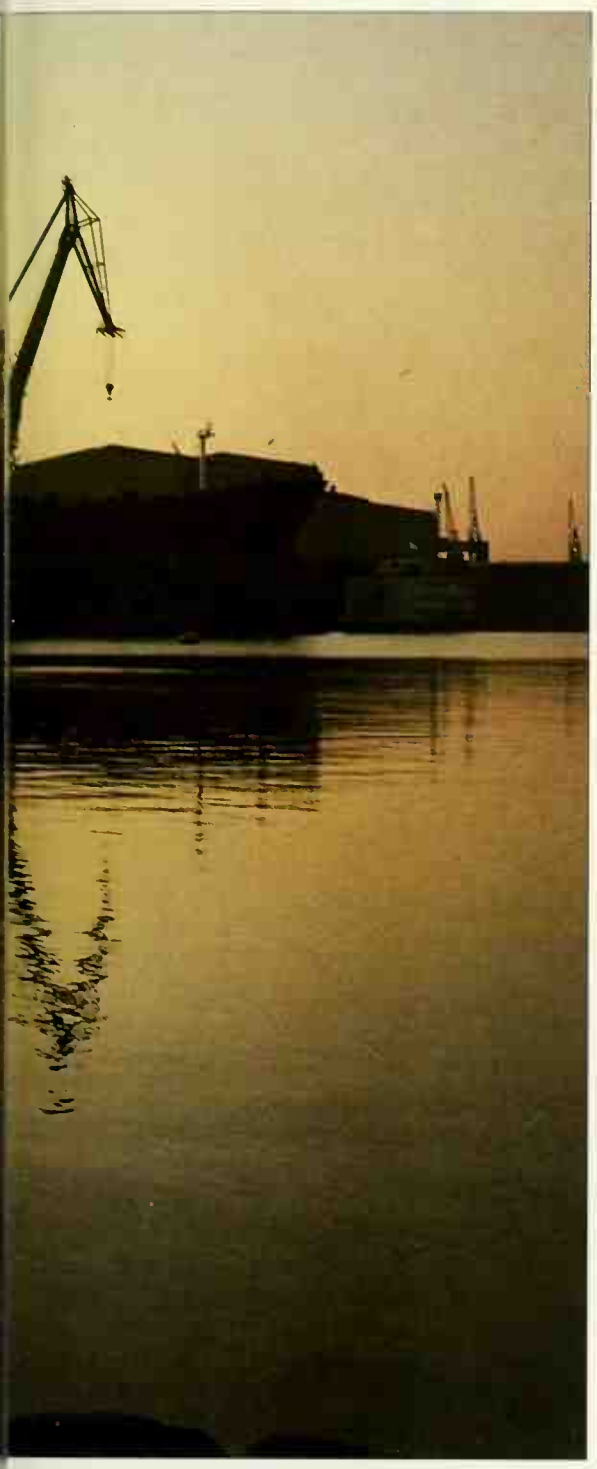
The land

Denmark is an extension of the North European Plain, and it averages only about 30 m (100 ft) above sea level. Its landscapes are the product of ice age glaciation; the division between eastern and western Jutland lies along the line of an ancient moraine, or deposited glacial debris. To the north Denmark's largest lagoon, the Lim Fjord, cuts right across the country. At the extreme north of the country, the long sandspit known as the Skaw points toward the Swedish coast.

East of Jutland, across the Little Belt strait, are the island of Fyn and the smaller island of Langeland to the southeast. Beyond it and across the Great Belt is the island of Sjaelland; Denmark's capital city, Copenhagen, is situated on its eastern coast. Suburbs now cover most of the coastal area along the Sound, which stretches northward from the capital to Helsingør (Elsinore). Far out in the eastern Baltic lies the granite island of Bornholm, geologically a part of Sweden.

Climate

Denmark's climate is cool and temperate, but warmer than the norm for its latitude. Although its western coast is exposed to the North Sea, it receives the benefit of the North Atlantic Drift. Summers are usually fairly warm, but rainfall is high.



Early morning in Copenhagen Dawn brushes the bronze statue of Hans Christian Andersen's *Little Mermaid* in Copenhagen harbor, a symbol of Denmark's close association with the sea, as are the wharves and dockyards in the background

Plants and animals

Roughly one-tenth of the country is forested, mostly with conifer plantations that have replaced the natural deciduous woodlands. On the west coast of Jutland, planted trees break the force of the North Sea winds, as well as binding and holding the sandy soil.

Proximity to humans means that few large mammals remain, though there are Red deer in the forests and plantations of the Jutland peninsula. The country has a rich profusion of bird life including migratory storks, but pollution has killed or damaged much freshwater animal life. Marine fishes have also been affected, though they continue to provide a good income for Denmark's fishermen.

The Faeroes – islands of sheep

The Faeroes are a group of 22 islands lying in the Atlantic between Scotland and Iceland, formed by basaltic lavas similar to those found in Iceland. Some 18 of the islands are inhabited. The characteristic landscape is harsh and rugged with high coastal cliffs and treacherous straits between islands.

The climate, with mild winters and cool summers, benefits from the warm North Atlantic Drift. Fog and rain are frequent. Mosses and grasses grow well in the mountain bogs, but trees survive only in plantations that are sheltered from the frequent strong winds. Native wildlife consists mainly of seals and a rich variety of seabirds, including puffins and eider, valued for their feathers. There are no native land mammals: rats and mice were introduced by early settlers, and Viking colonizers in the 9th century brought sheep to the islands. An old proverb says that "sheep's wool is Faeroe gold", and the islands' name even means "sheep islands".

In about 1000 AD the Faeroese were converted to Christianity. The islands came under Norwegian rule in 1035, and passed to Denmark in 1380. From 1709 to 1856 a Danish royal trade monopoly held back economic development and impoverished the population. In the 19th century a growing nationalist movement led to the creation of the written Faeroese language, based on Old Norse. Demand for home rule strengthened, and in 1948 the Faeroes became a self-governing dependency of Denmark. Today the Faeroes have their own 32-member parliament, the Lagting, which elects the Landsstÿri, an administrative committee. Royal authority is represented by a Danish commissioner.

Nearly one-third of the inhabitants live in or around the main harbor and capital, Thorshavn. Faeroese is the main language, though Danish is still taught in all schools. The islands have their own radio broadcasting system and there is also a limited television service. Most people are members of the Danish Lutheran Church.

The islanders enjoy many distinct cultural traditions. Ballad-dances, less common than they used to be, take place between Christmas and Lent in the Christian calendar. Ballads concerning legend, folklore or Faeroese history are sung aloud to provide the music for a ring-dance. The wording of the ballads has remained unchanged from one generation to the next.

Woolen yarns and knitted garments are produced by the islanders, but today fishing and associated industries are far more important, providing some 95 percent of exports. Whaling, for meat and oil, has always been part of the Faeroese economy and continues today despite international concern over the depletion of whale stocks.

Less than one-twentieth of the land is cultivated, mostly producing grass for fodder and vegetables, especially potatoes. Coal is mined on Sudhuroy, but hydroelectric power meets all the islands' needs. There are regular inter-island ferries and shipping communications with Denmark, Britain, Norway and Iceland throughout the year. In summer, passenger and vehicle ferries serve a small tourist industry. The airport on Vágar offers regular flights to Iceland and Norway and daily flights to Copenhagen.

Living in isolation A turf-covered wooden cabin on Strømø, the largest of the Faeroe Islands, is silhouetted against a silver, wind-ruffled sea. Fishing and farming communities are scattered around the islands' deeply indented coasts.

SOCIETY

The Danes are deeply interested in their past, while being very receptive to new cultures. The Danish welfare state has created a healthy and equitable society.

History

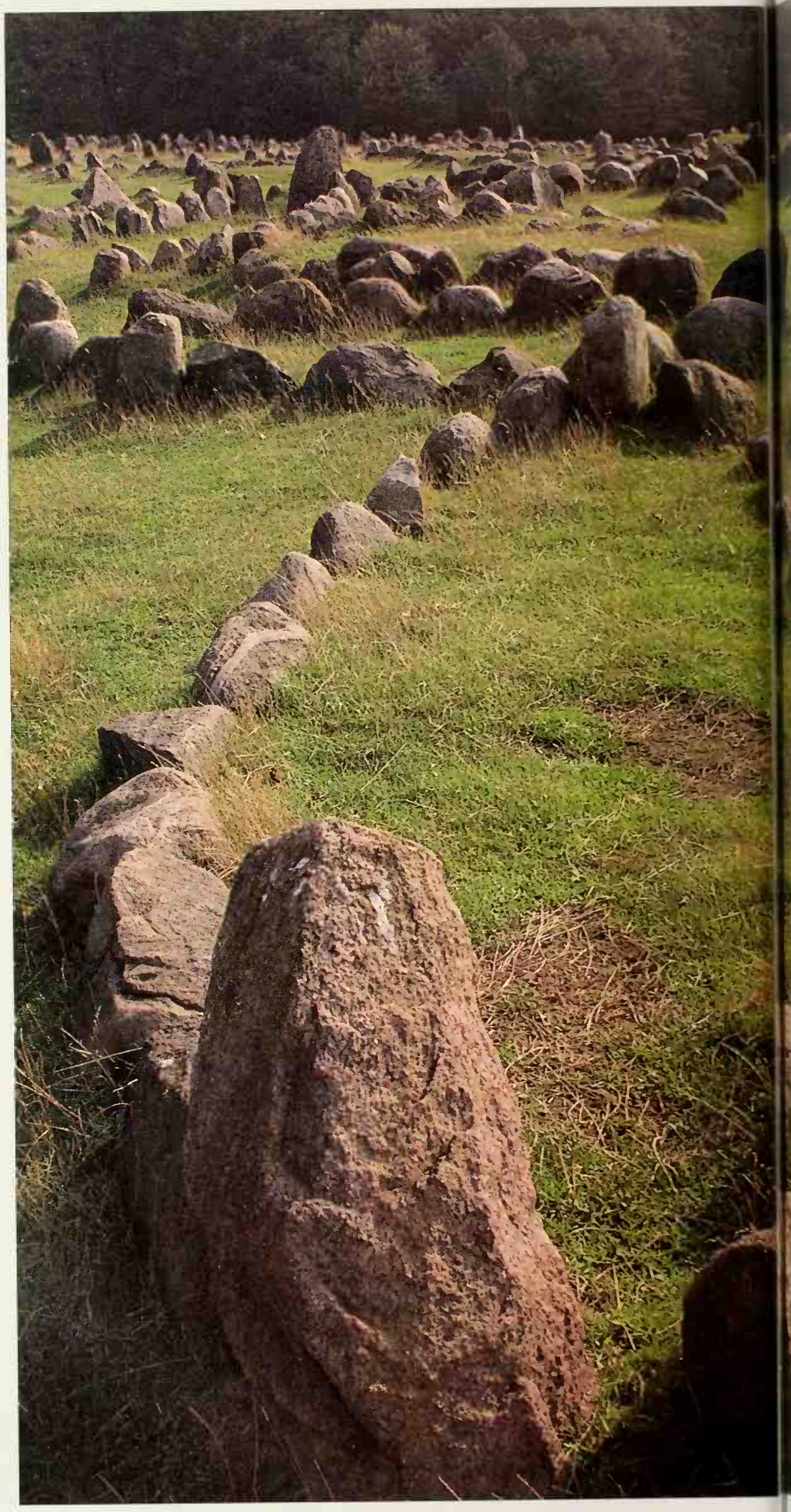
Denmark's early history is shrouded in legend. Reliable historical accounts begin in the 9th century, when the Danish kings resisted the northward expansion of the Franks. In the 10th century, King Harald Bluetooth of Jutland (c. 910–c. 985) brought Christianity to his people. Harald's son Sweyn Forkbeard (d. 1014) conquered England, creating an empire that lasted for another two generations.

After the coronation of Erik of Pomerania (c. 1381–c. 1459) in 1396 at Kalmar, in southeastern Sweden, Denmark, Sweden and Norway were united under a single crown. The Kalmar Union sought to counter the might of the Hanseatic League, a confederation of northern German towns and merchants formed to protect their trading interests in the Baltic. The Union was effectively broken when Sweden left in 1448, though it continued to exist until 1523.

Civil war in 1534–36 brought about the establishment of the Lutheran Church in Denmark, allowing King Christian III (1503–59) to seize the property of the Catholic monasteries. The strength of the crown encouraged Christian IV (1577–1648) to try to reestablish Danish authority over the Baltic, but he failed. The Peace of Copenhagen (1645) set the frontiers that are mostly in existence today, though Norway remained subject to the Danish crown.

During the wars that engulfed Europe at the beginning of the 19th century Denmark allied itself with the French emperor Napoleon I (1769–1821). After Napoleon's defeat at the Battle of Leipzig in 1813, Swedish forces attacked Danish possessions from the south. The resulting defeat meant that Denmark was forced to give up all rights to Norway, though it retained Iceland, Greenland and also the Faeroe Islands.

In 1864 war broke out with Prussia and Austria over the long-disputed question of possession of the duchies of Schleswig and Holstein at the southern end of the



Viking graves at Lindholm Høje, near Ålborg in northern Jutland, date from between the 8th and 11th centuries. The stones around each burial place have been laid out in a boat shape, showing the particular symbolic value ships held for these seafaring people.

Equestrian king A statue of King Frederick V (1726–66) stands in a courtyard in the Amalienborg, the palace – held to be a masterpiece of the rococo style – that he built in Copenhagen. It is still the principal residence of the Danish royal family.

Jutland peninsula. Denmark was forced to relinquish its claim to both, but in 1920 a plebiscite returned northern Schleswig from German to Danish rule.

In 1940, during World War II, neutral Denmark was occupied by German troops. However, it remained a sovereign state until August 1943, when the German Reichskommissionär took control in response to an increasingly active Danish resistance movement. In 1949 Denmark joined the North Atlantic Treaty Organization (NATO), though it refused to allow United States' air bases on Danish soil. In 1973 it joined the European Community, though in 1992 a national referendum voted against acceptance of closer political and economic union, leaving its future role in the EC in some doubt.

Government

Denmark has been a constitutional monarchy since 1849. The present queen is Margrethe II (b. 1940). The monarch's most significant duty is to appoint the prime minister and the cabinet who are accountable to the single-chamber parliament, the Folketing, which has 179 members. Legislation passed by the Folketing must be signed by the monarch before it becomes law.

Denmark is divided into 14 counties and 277 municipalities. Parliamentary elections are held every four years, and everyone aged 18 or over is entitled to vote. The results are determined by proportional representation. The elections that were held in the early 1990s produced a large number of small parties and a series of coalition governments.

Greenland and the Faeroes each have two representatives in the Folketing. Danish central government remains responsible for the islands' foreign affairs, defense, finances and legal matters.

Denmark's non-nuclear policy has led to heated debates with other NATO countries over the presence of nuclear weapons on visiting warships. In 1988 the issue caused a snap general election, leading to a coalition government.

People

The Danes are closely related ethnically and linguistically to the other Scandinavian peoples. The only significant ethnic minority in the country is a small German colony in southern Jutland. Many Danes speak German and English; both languages are taught in schools.

The Lutheran church has been the national church of Denmark since the 16th century, and more than nine-tenths of the population belong to it. Danish church buildings, with their stepped gables, preserve examples of Christian art from the 11th century onward.

Danish culture belongs to the European mainstream. The country has produced internationally renowned writers including Hans Christian Andersen (1805–75) and the philosopher Søren Kierkegaard (1815–55). The Royal Danish Ballet company preserves the choreographic traditions of the early 19th century.

ECONOMY

Traditionally, Denmark has always relied heavily on agriculture. Today it is an industrial society, but one in which agriculture still has a vital role to play.

Agriculture

Farming accounts for some two-thirds of Denmark's land area, but only about one-sixteenth of the labor force. Most farms are relatively small; agricultural cooperatives coordinate processing and marketing. The result is a highly efficient system of intensive farming, with the emphasis on livestock and dairy products. The major crop is barley. About half the country's farm produce is exported, mostly to the rest of the European Community. The remainder supplies the food-processing industry, the second-largest employer in Denmark.

Denmark's fishing industry is ranked among the top 15 in the world, and the coastline provides many natural harbors. Herring, cod and flatfish account for half the total catch.

Industry

The country's mineral resources are heavily exploited. Coal and metals are scarce, but granite, boulder clay and white chalk are easily extracted and used in the construction industry. Kaolin, a fine white clay, is used in ceramic and paper manufacture.

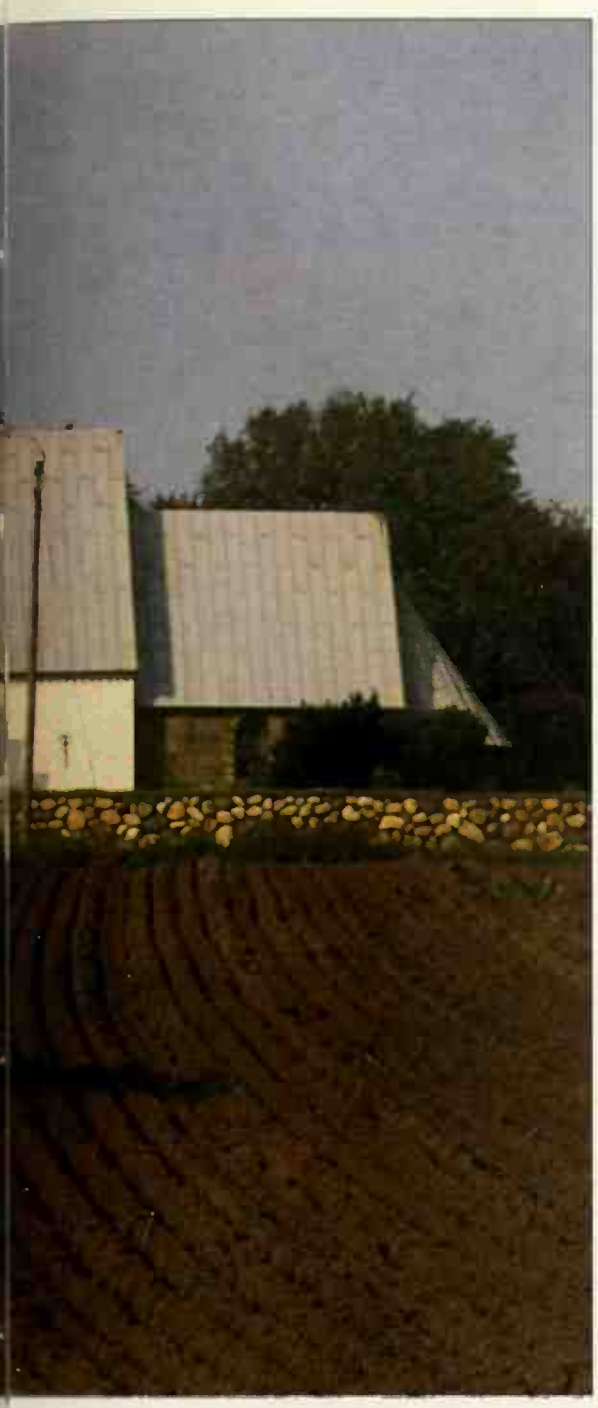
Offshore oil and gas fields in the North Sea supply about half of the country's energy requirements. Oil and natural gas from the Danish sector is transported to terminals at Esbjerg on the west coast of Jutland. Several power stations are fueled by natural gas, and surplus energy is sold to Germany and Sweden. Denmark has no plans for nuclear power. Wind turbines are increasingly common in the flat, windswept countryside of Jutland, and newer houses supplement their heating systems with solar or geothermal heat.

Until the 1960s Denmark's main export revenue came from agriculture. Tourism is another important source of income, but is being supplanted by industry. Products include cement, crude steel, machinery and transportation equipment, processed foods, chemicals, paper and furniture. Shipping is the third-largest export earner.

Trade and commerce

Denmark trades almost entirely within Europe. Traditionally its most important trading partner has been the United Kingdom. The harbor town of Esbjerg was built in 1869 specifically to service this trade. Today Germany and Sweden are equally significant markets.

In the late 1980s high consumer spending in Denmark was causing a severe balance-of-payments problem and the highest foreign debt in the European Community. The government responded with radical measures including tax cuts and reductions in welfare expenditure.



Plowing for profit (*above*) Denmark's fertile soils are its most valuable resource, and its small farms are extremely efficiently run. Dairying and pig farming are the most important activities; most arable land is used to grow fodder crops.

Transportation and communications

Historically, Denmark's main lines of communication have been dependent on the sea. In addition to the sea routes there are about 420 km (260 mi) of inland waterways. Two bridges across the Little Belt connect Jutland with Fyn, but until recently Sjaelland and most of the smaller islands could be reached only by a highly sophisticated network of ferries, many of them designed to carry both railroad trains and road vehicles. A massive new engineering project was launched in 1989 to build a transportation link across the Great Belt. The project consists of a road–rail bridge leading to a rail tunnel and a road bridge, permanently linking Fyn and Sjaelland.

Road and rail networks are extensive and well maintained; there are 70,000 km (44,000 mi) of roads and 2,500 km (1,500 mi) of track. Danish State Railways (DSB) operate bus routes throughout the country in addition to running 80 percent of the national and local railroad systems. However, in this small, flat and densely populated country bicycles are a cheap and convenient form of transport; there are approximately twice as many bicycles as motor vehicles in Denmark.

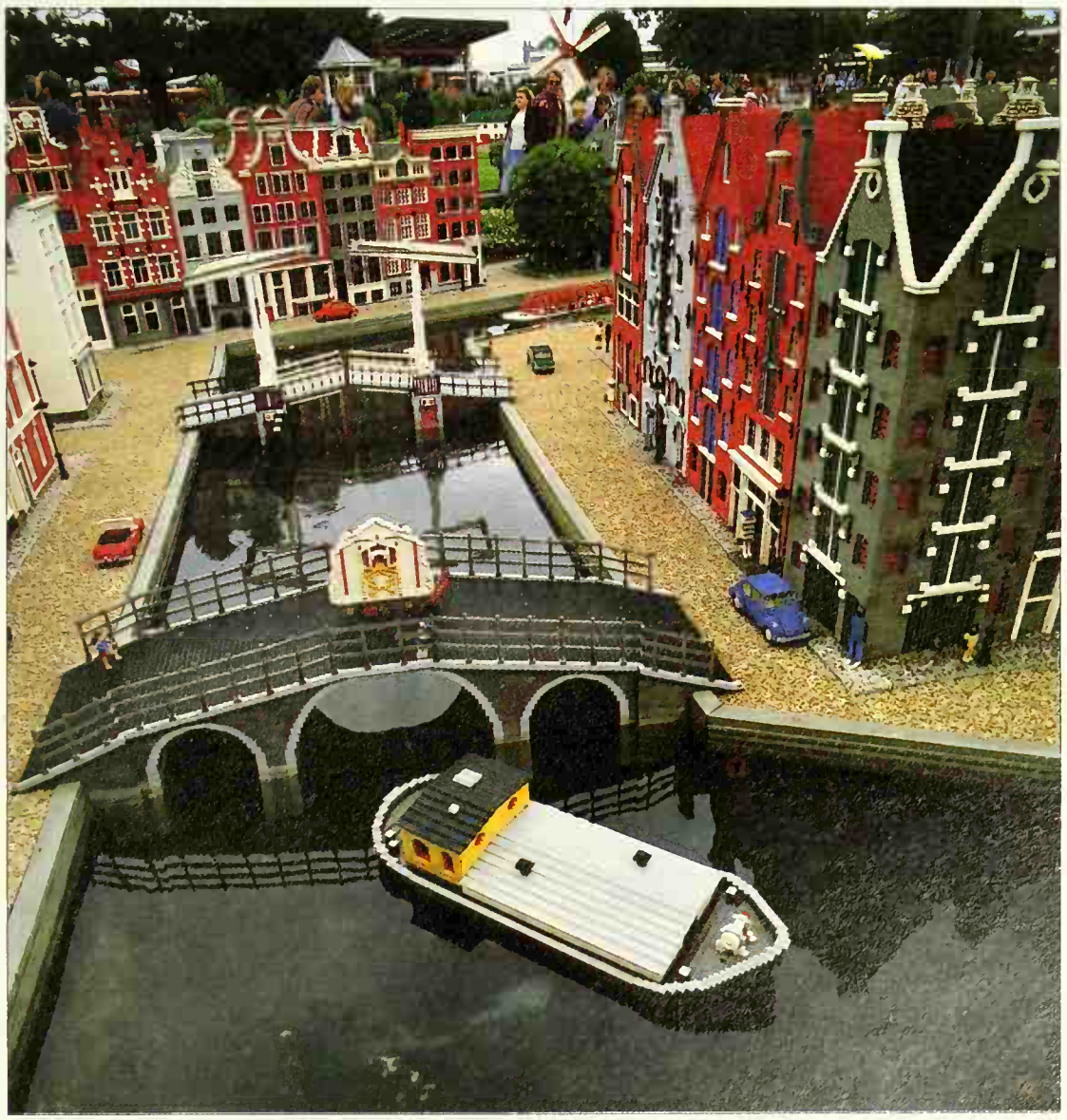
Denmark has 13 airports. Kastrup, near Copenhagen, is one of the busiest in Europe. It handles internal services to Jutland and Bornholm as well as international traffic, and is also a major base for the Scandinavian Airlines System (SAS), which is operated jointly by Norway, Sweden and Denmark.

Until the 1980s Denmark's entire television and radio output was controlled by Danmarks Radio, an independent public body funded by license fees. A second television channel with commercial advertising was launched in 1988, and Danes can also receive television broadcasts from Germany, Sweden and Norway. There are about 60 newspapers published in Denmark.

Health and welfare

Denmark has one of the oldest and most extensive welfare programs in the world. It offers almost total protection, including a universal retirement pension, a universal child benefit paid up to the age of 16, and free health checks for children. Compulsory health insurance provides free hospital treatment and free home nursing; drugs and medicines are heavily subsidized. Unemployment insurance is voluntary but widespread.

Education is compulsory from the ages of 7 to 16. Most schools are free, and even private schools receive state support. Youth schools offer both vocational and other training. The traditional folk high schools, imitated in other countries, provide a broad-based curriculum of adult education. There are five universities, and further education is also available at professional institutions and commercial and technical colleges.



Model attractions A model of Copenhagen harbor on display at Legoland, a purpose-built park at Billund in central Jutland – home of Lego building blocks. The displays, made from 30 million blocks, attract tourists from all over Europe and beyond.

Iceland

REPUBLIC OF ICELAND

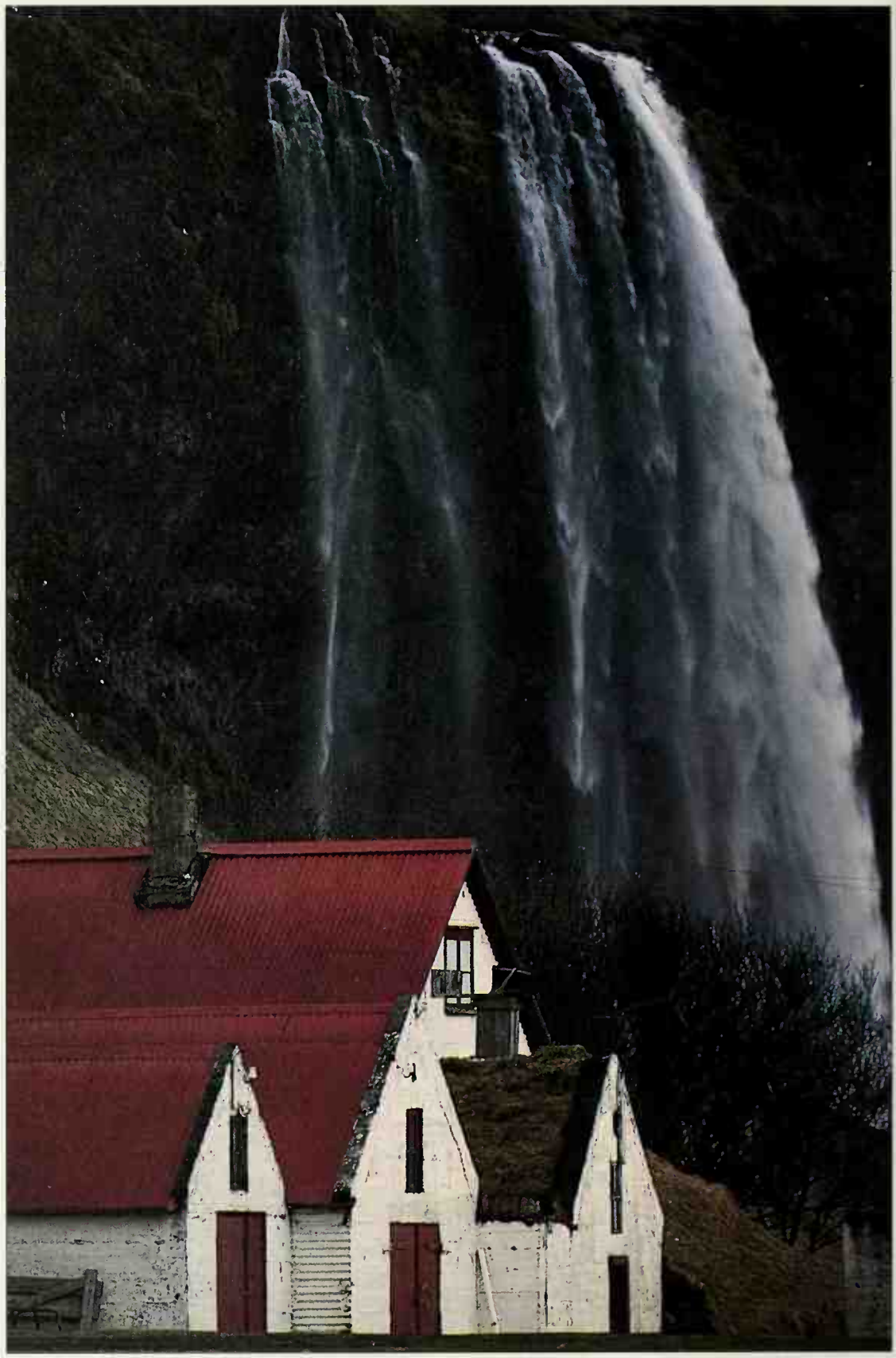
ICELAND IS AN ISLAND REPUBLIC JUST SOUTH OF the Arctic Circle. Its culture derives from the original 9th-century Viking settlers. The country and its people have grown up in a harsh, volcanically active environment unmatched anywhere else in Europe.

ENVIRONMENT

Geologically Iceland is very young. It has been built up by a series of volcanic eruptions from the mid-Atlantic ridge – the boundary of two of the Earth's tectonic plates. In 1973, the island of Heimaey off the south coast had to be evacuated after the eruption of the volcano Helgafell. Earthtremors are frequent, and hot springs are common in volcanic areas, most notably at Geysir in the southwest. Similar springs gave the capital its name – Reykjavik, or "Smoky Bay" – and today they provide most of the country's hot water and heating.

At the heart of the island is a high plateau partly covered by a glacier and surrounded by mountains. Glaciers account for over one-tenth of Iceland's total land area. The largest is Vatnajökull in the southeast, covering an area of 8,300 sq km (3,200 sq mi). Most of the population live on the narrow coastal plain around Reykjavik in the southwest. In the north steep valleys penetrate deep into the interior.

The northwest of the island tends to be cooler than the southeast, and snowfall there is more frequent. Temperatures are well above the average for this latitude, due to the influence of warm southwesterly winds from the tropics associated with the North Atlantic Drift, but gales are common, especially in the mild, humid winters. Summers are generally cool, and rainfall is high throughout the year. Aurora borealis, or the northern lights, can often be seen, especially in fall and early winter.



Water and rock A waterfall plummets down a cliff of basalt rock at Seljalands Foss in southern Iceland. The island's dramatic scenery includes lunar-like lava fields, vast glaciers and snowfields, active volcanoes and geysers spouting steam high into the air.

Woodland once covered large areas of the island, but has long since been cleared by settlers; only 1 percent of the country is forested. The characteristic vegetation is mosses and lichens with a few shrubs. Sparse grassland is limited to valleys and the coastal plain.

Foxes are Iceland's only native mammal. Mice and rats came with the Vikings, as did domestic animals such as the sturdy Icelandic pony. Reindeer were introduced in the 18th century. Bird life is rich and varied, especially on sea cliffs and at Lake Mývatn in the north. Many migratory birds visit the island on their long seasonal journeys.

SOCIETY

The first settlers in Iceland were probably Irish monks. They were followed in about 870 AD by Vikings from Norway, Ireland and Scotland. The chieftains in each district set up a "thing" or local assembly to settle quarrels and feuds common among landholders, and about 930 a national assembly, the Althing, was established – the basis of Europe's oldest

parliament. It was through a decision reached in the Althing that the population accepted Christianity in 999–1000.

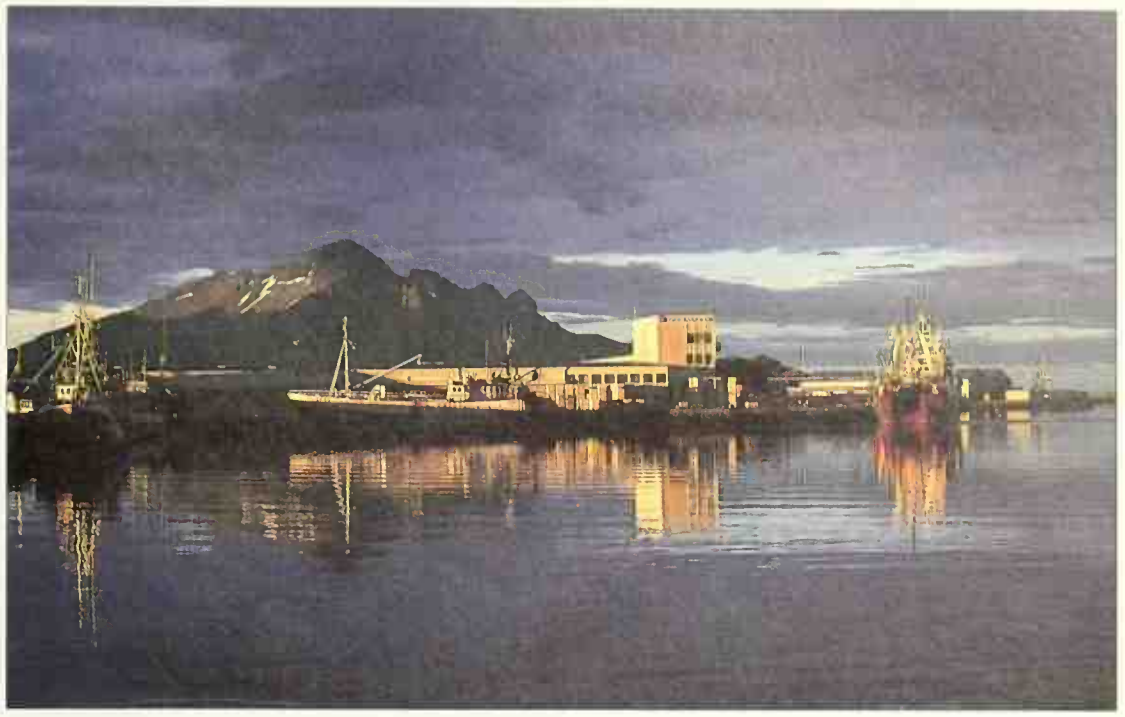
During the 13th century Iceland's chieftains accepted Norwegian rule in order to preserve domestic peace, but in 1380 Norway itself fell under Danish sovereignty, and Iceland entered a long period of decline, exacerbated by the Danish crown's commercial monopoly, which crippled trade.

In the 19th century the demand for independence and constitutional reform grew. Trading restrictions were lifted, and the Althing was granted a degree of legislative authority. Conditions remained harsh, however, and there was massive emigration to Canada until the development of the fishing industry brought increased prosperity at the beginning of the 20th century; the island achieved full self-government in 1918.

During World War II British and American forces used Iceland as a base. The German invasion of Denmark in 1940 had severed communications with the island, and in 1944 the Althing cut the last ties with Denmark by declaring Iceland an independent republic.

Since 1951 there has been an American military base at Keflavík; this, and Iceland's membership of the North Atlantic Treaty Organization (NATO), have been hotly debated political issues. Fishery protection is another major concern. In 1975 the government declared a 370-km (200-mi) fishing limit – a decision that led to one of several "cod wars" with the United Kingdom. However, in 1976 the British government recognized the new international limit.

Icelanders are proud of their Viking roots, and many can trace their ancestry back to the earliest settlers, whose names are recorded in the *Landnama Bok*, or Book of Settlement. The modern Icelandic language is directly descended from Old Norse, the language of the Vikings. The medieval sagas, which mingle imagination and folklore with historical facts about the early settlers, can be easily read by modern Icelanders. Most of the islanders belong to the Lutheran Church, which was established in Iceland in the 16th century.



The sun at midnight illuminates the harbor of Höfn, in southeastern Iceland. Fishing, once a smallscale family activity, is now big business and the huge trawlers and processing plants are owned by a few large companies or cooperatives.

ECONOMY

Fishing is the cornerstone of Iceland's economy, accounting for three-quarters of all exports. Much of the fishing fleet is government-owned. Attempts are being made to tackle the problems of overfishing and declining fish stocks of cod, capelin and herring. The Marine Research Institute regulates operations with a system of quotas and bans. Fish farming is proving increasingly successful.

Until the beginning of this century sheep farming was the main occupation of all Icelanders. There are still some 4,500 farms, but only about 1 percent of the total land area is cultivated, producing fodder crops, potatoes and turnips. Grazing for livestock (sheep, cattle and ponies) occupies about 20 percent of the land. Fresh vegetables and flowers are available all year round from greenhouses heated by geothermal power, a cheap and abundant energy source.

Several major industrial installations are also run on geothermal power. Minor industries include the production of woolen yarns for carpets and clothing, canned fish, skins and furs. There is a small but significant electronics industry.

Tourism has been growing steadily since the 1950s. Akureyri offers spring and summer skiing facilities, and Reykjavik is willing and able to stage major international conventions.

Iceland has about 11,000 km (7,000 mi) of roads, but many of them are impassable in winter. There are no railroads on the island and in many places Icelandic ponies still provide an important means of local transportation. Icelandair operates domestic and international flights from Reykjavik. The merchant fleet carries up to half of Iceland's imports and more than half of its exports.

Icelanders are among the healthiest people in the world. Compulsory health insurance allows many medical services to be offered at minimal cost, and hospital care is free. All education is also free, and compulsory from the ages of 7 to 16. Further education is available and there is a university at Reykjavik.

NATIONAL DATA

Land area 103,000 sq km (39,768 sq mi)

Climate

	Altitude m (ft)	Temperatures January °C(°F)	July °C(°F)	Annual precipitation mm (in)
Reykjavik	126 (413)	0 (32)	11 (52)	805 (31.7)

Major physical features highest point, Hvannadalshnúkur 2,119 m (6,951 ft); longest river, Pjórsá 230 km (143 mi)

Population (1990) 253,000

Form of government multiparty republic with two legislative houses

Armed forces none (United States forces: navy 1,800, air force 1,300)

Capital city Reykjavik (96,000)

Official language Icelandic

Ethnic composition Icelandic 96.3%; other Scandinavians 1.3%; American 0.5%; others 1.9%

Official religion Lutheranism

Religious affiliations Lutheran 96.2%; nonreligious 1.3%, Roman Catholic 0.9%; other Christians 0.6%; others 1.0%

Currency 1 Icelandic króna (IsK) = 100 aurar

Gross national product (1989) US $5,351 million

Gross domestic product (per person 1990) US $21,150

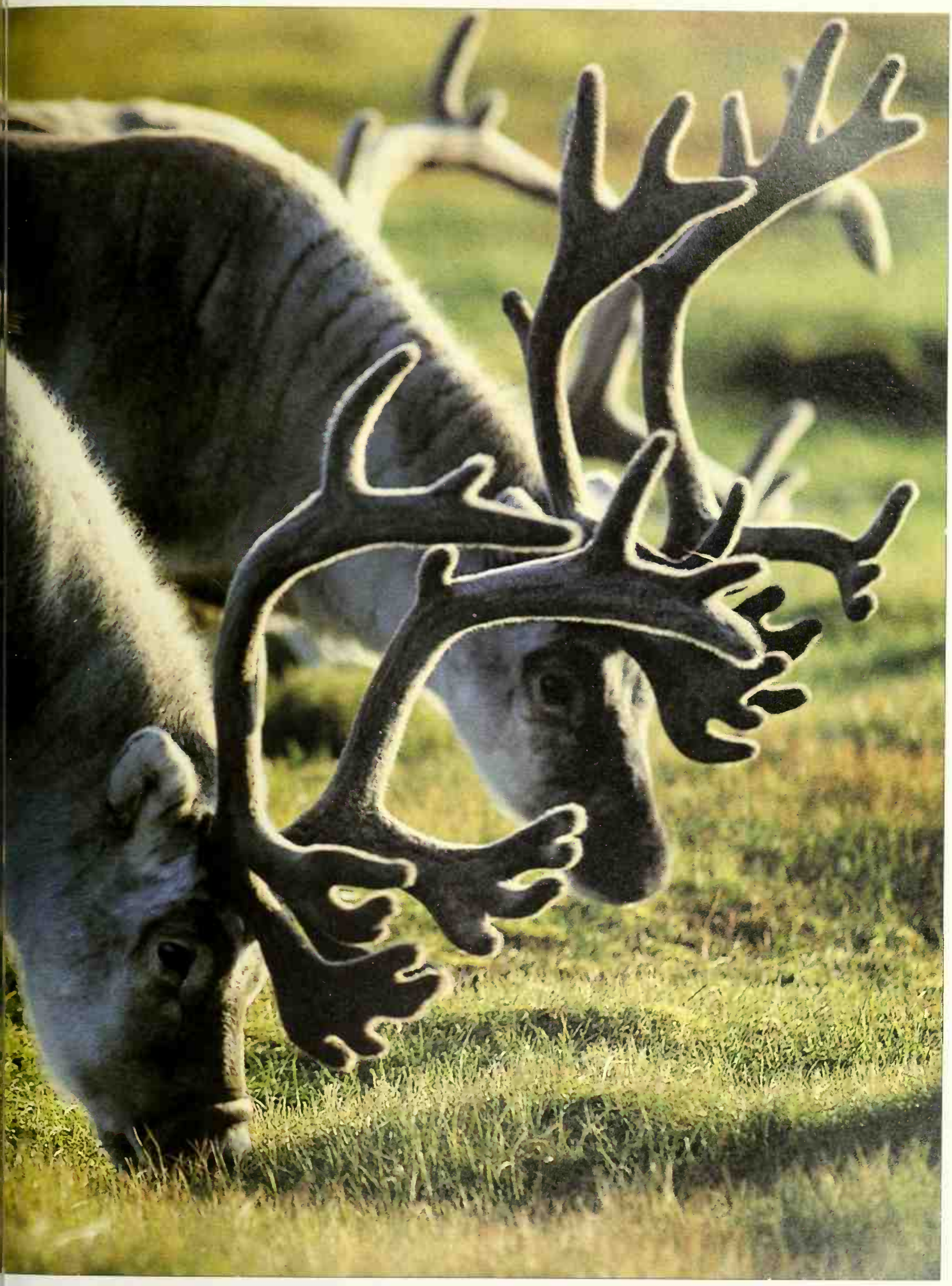
Life expectancy at birth male 74.5 yr, female 79.7 yr

Major resources agriculture/fisheries 21.6% GNP; manufacturing 12.0% GNP; trade 13.4% GNP; finance/public administration/defense 39.5% GNP

REGIONAL PROFILES

The Nordic Countries

Svalbard reindeer grazing



PHYSICAL GEOGRAPHY

LANDS OF THE MIDNIGHT SUN · ICE ON THE LAND · ROCKS AND LANDSCAPE

No region of the world has so many people living at such a high latitude as the Nordic countries. Warmed by the North Atlantic Drift current, the climate along the western coast of Norway is surprisingly mild. In contrast, the landscape is harsh, with snowcapped mountains, waterfalls, and many deep steep-sided fjords. Forested mountain slopes stretch up the spine of Norway and Sweden to the fells and plains of Lapland, where winters are long and dark, the subsoil is permanently frozen and the surface typically treeless tundra with peat bog. To the east the scenery is dominated by forests and lakes; only in the south of the region are there extensive areas of fertile lowlands. Some 900 km (570 mi) to the west, in the Atlantic Ocean, Iceland lies on the Mid-Atlantic ridge, where volcanic activity is still creating new land.

COUNTRIES IN THE REGION

Denmark, Finland, Iceland, Norway, Sweden

LAND

Area 1,255,017 sq km (484,437 sq mi)
Highest point Glittertind, 2,470 m (8,104 ft)
Lowest point sea level
Major features islands, fjords, mountains and high plateau in west, lakelands east and west of Gulf of Bothnia, lowlands in south

WATER

Longest river Göta–Klar, 720 km (477 mi)
Largest basin Kemi, 51,000 sq km (20,000 sq mi)
Highest average flow Kemi, 534 cu m/sec (19,000 cu ft/sec)
Largest lake Vänern, 5,390 sq km (2,080 sq mi)

CLIMATE

	Temperature °C (°F) January	July	Altitude m (ft)
Bergen	2 (36)	15 (59)	44 (144)
Oslo	−5 (23)	17 (63)	96 (315)
Stockholm	−3 (27)	18 (64)	11 (36)
Helsinki	−7 (19)	17 (63)	58 (190)
Reykjavik	0 (32)	11 (52)	126 (413)

	Precipitation mm (in) January	July	Year
Bergen	179 (7.1)	141 (5.6)	1,958 (77.1)
Oslo	49 (1.9)	84 (3.3)	740 (29.1)
Stockholm	43 (1.7)	61 (2.4)	555 (21.9)
Helsinki	49 (1.9)	68 (2.7)	641 (25.2)
Reykjavik	90 (3.5)	48 (1.9)	805 (31.7)

NATURAL HAZARDS

Cold, glacier surges, volcanic eruptions in Iceland

LANDS OF THE MIDNIGHT SUN

Almost all of the Nordic region lies north of latitude 55°N, and one third lies within the Arctic Circle (66° 32′N). More than 20 million people live in the region, where long winter nights are matched by long summer days. The Russian Republic is the only other country to have substantial numbers of people living at this latitude; in North America there are no major cities north of 55°N.

What makes the Nordic countries more populated than might be expected is their surprisingly mild climate. The warm waters of the North Atlantic Drift are blown toward Scandinavia by westerly winds, which absorb some of the heat and carry it inland. Their moderating influence is felt most strongly on the southwest coast of Norway. Moving to the north and east, continental influences become stronger. Winters grow longer and colder and summers shorter but warmer. Extremes are greatest in the east. In Finland (not part of Scandinavia, though a Nordic country) nowhere has an average January temperature greater than 0°C (32°F), but in July it can be as high as 30°C (86°F). The mountain climates of Norway and Sweden are also much harsher, with long, cold winters and permanent snow cover over 1,000 m (3,300 ft).

Over two-thirds of the region is susceptible to summer frosts, which are an ever present threat to agriculture. Growing seasons are correspondingly short, from 180 days in western Norway to less than 130 days in Lapland.

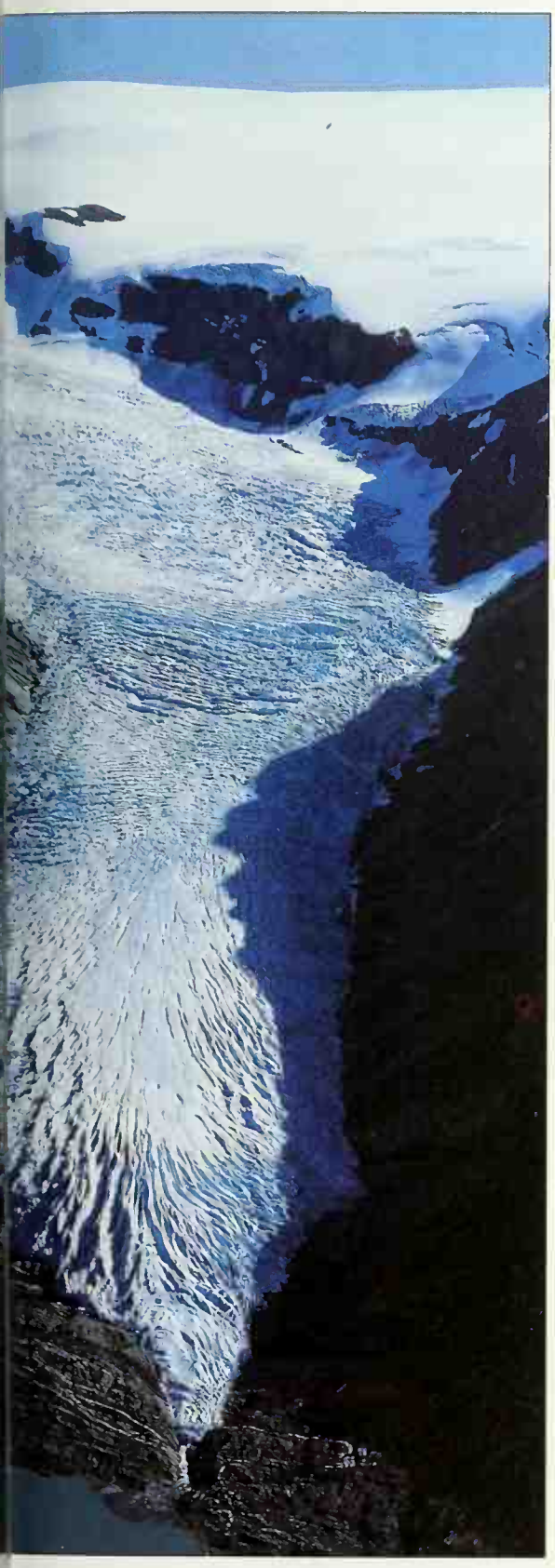
The westerly winds bring a lot of precipitation to the west coast of Norway, where the mountain barrier forces the warm air to rise and drop its moisture. Most areas by the sea receive at least 1,000 mm (40 in) a year, but higher up 4,000 mm (160 in) is common. To the northeast, in the rainshadow of the mountains, much less rain falls. In Lapland and at the head of the Gulf of Bothnia annual rainfall is less than 500 mm (20 in) on average. Much of the precipitation falls as snow. On the mainland, only in Denmark does snow lie for less than 40 days a year.

Where winter shapes the land

Scandinavia and Finland were covered by ice during the last glaciation, which ended only about 10,000 years ago. The land is slowly rising as it recovers after the

Glacial erosion in action The ice that extended over much of Scandinavia in the past has left its traces in many parts of the region. The valley of Svartisen just north of the Arctic Circle was once completely obscured by the ice, but is now occupied by only a small glacier.

Fertile plains in Denmark Southern Sweden and Denmark are different from the rest of the region because there are large areas of fertile lowland. These flat landscapes are the result of deposition rather than erosion, and with their milder, drier climate are intensively cultivated



removal of the great weight of ice. The scenery of the region shows the influence of the ice and other landscape processes associated with cold climates. Rocks have been scraped bare and scored by the ice, the soils have had little time to develop so they are thin, and to the south there are moraines formed from debris deposited by the ice.

The western coast of Norway is very rugged, with bare uplands, permanently snowcapped mountains, long, deep fjords carved by glaciers, and over 150,000 rocky offshore islands. The coastline is so indented that if it were straightened out it would stretch halfway around the globe.

Map of physical zones The landscapes of the Nordic countries have been shaped by ice. Its influence can be seen everywhere – in the backbone of mountains that extends along the peninsula, in the tundra areas of Lapland, and in the fertile lowland plains of the south.

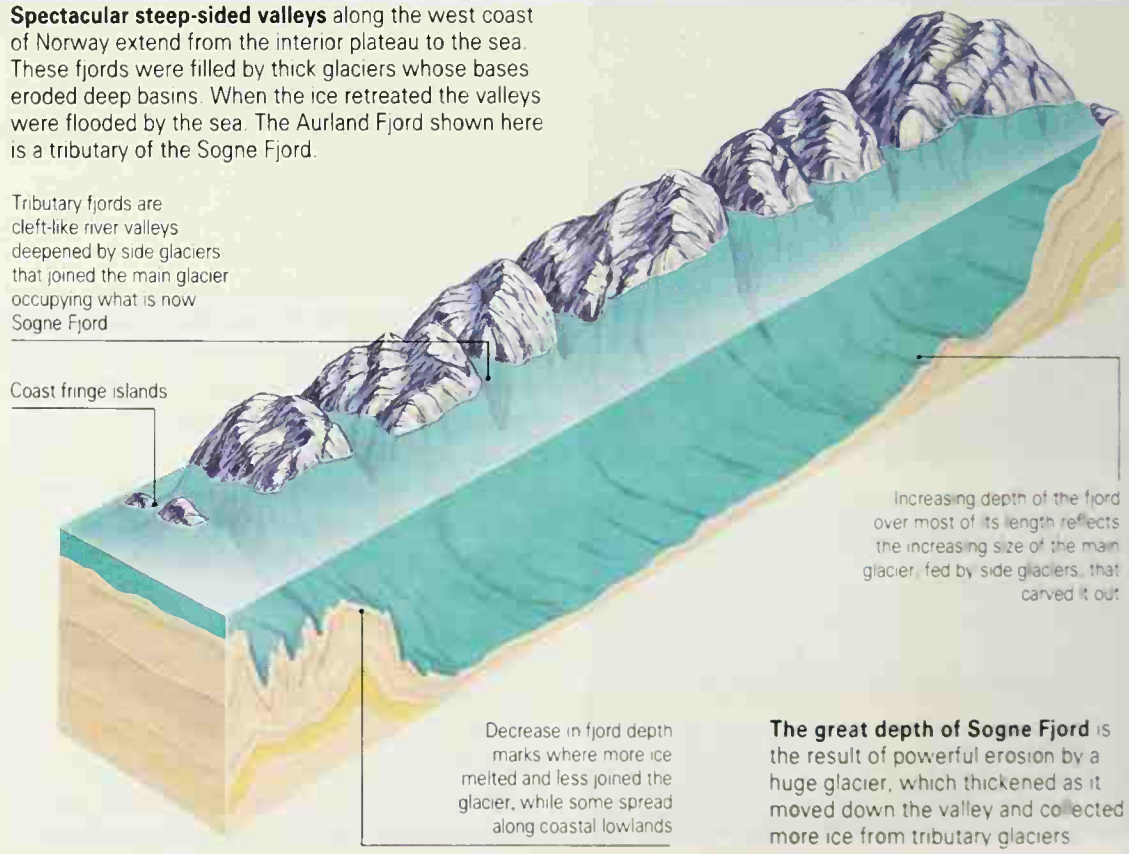
In the north of the region the undulating fells and plains of Lapland are largely tundra. Peat bogs form on the flat areas where the surface melts in summer, but the water cannot drain away because of the permanently frozen ground below. Forests of pine, spruce and birch cover much of the land farther to the south, and lakes are common. The lowlands of Denmark and southern Sweden have deeper soils and a milder climate.

ICE ON THE LAND

Winter still dominates the climate of the Nordic countries, but in the recent geological past its effects were much greater. During the ice ages of the past 2 million years the region has been in the freezing grip of a glacial period, or glaciation, on at least three major occasions.

At these times the whole region, including what is now sea, was covered by ice sheets and glaciers, possibly up to a depth of 3,000 m (10,000 ft). Glaciers in armchair-like rock basins (cirques) in the mountains fed into valley glaciers, which spread out at the foot of the mountains and joined with others to form slow-moving piedmont glaciers and eventually huge ice sheets. The advance and retreat of the ice cover has had a profound effect on the scenery. In some areas the ice has shaped the landscape by removing material from it (erosion), in others by adding to it (deposition).

Spectacular steep-sided valleys along the west coast of Norway extend from the interior plateau to the sea. These fjords were filled by thick glaciers whose bases eroded deep basins. When the ice retreated the valleys were flooded by the sea. The Aurland Fjord shown here is a tributary of the Sogne Fjord.



The great depth of Sogne Fjord is the result of powerful erosion by a huge glacier, which thickened as it moved down the valley and collected more ice from tributary glaciers

Landforms eroded by the ice

As the ice moved across the land it scraped the surface bare of loose rocks and soil, so today soils in these areas are thin. The landforms produced range from small grooves and scratches (striations) where the bedrock has been scraped by glaciers with rocks embedded in them, to larger features such as the unevenly eroded asymmetrical mounds of rocks known as *roches moutonnées*.

The most spectacular features are where glaciers have eroded valleys in upland areas, making them deeper, broader and straighter. A broad U-shaped valley with tributary valleys hanging above it is classic glacial scenery, found widely in the mountain areas of Norway and Sweden. The fjords along the west coast of Norway are an extreme form of this erosion; they have been carved out over 150,000 years of glacial and interglacial periods. The deepest part of a fjord is well below sea level today; there is a shallow sill where the fjord meets the sea. When the ice retreated from the valleys the sea was able to invade them, creating a highly indented coastline. Sogne Fjord, the deepest, plummets to as much as 1,308 m (4,291 ft) below sea level, and extends inland for 204 km (127 mi).

Deposits on the land

Material eroded by the ice from the mountains and uplands of Norway and Sweden was deposited in lower-lying areas to the south and southeast. The movement of sediment took place on a huge scale, and in Denmark the deposits are typically between 30 and 50 m (100–160 ft) thick.

Glacial sediments are of two types. Those deposited directly by the ice contain angular fragments (called till), while material laid down by water from the melting ice is rolled along the streambed and becomes rounded, like gravel.

Moraines are composed of material deposited by ice. At the maximum limits of the ice and at points where it paused in its retreat, huge mounds or ridges of glacial rock debris were deposited. These terminal moraines cover a large part of southern Finland. In places, moraines that have been covered by the sea at some time since they were deposited have developed a rippled appearance (washboard moraines). Another common feature produced by glacial deposition are egg-shaped mounds. These can be some 400 m (1,300 ft) long and 20 m (66 ft) high, and are called drumlins.

In Sweden and Finland, water-worn sand and gravels form very distinctive ridges called eskers. They wind across the landscape for up to 300 km (180 mi) and can reach a height of 50 m (160 ft). They were laid down by streams running over, through or under glaciers. As long as the ice remained, the sand and gravel streambed was supported by its ice walls. When the ice eventually melted the deposits collapsed and formed ridges. The ridges become wider in places, marking where a delta formed at the mouth of a stream channel as it left the ice.

The Arctic fall Although it is well north of the Arctic Circle, northern Norway has a mild climate because of the influence of the North Atlantic Drift. The sea does not freeze in winter, and the growing season is long enough for deciduous silver birch trees to flourish

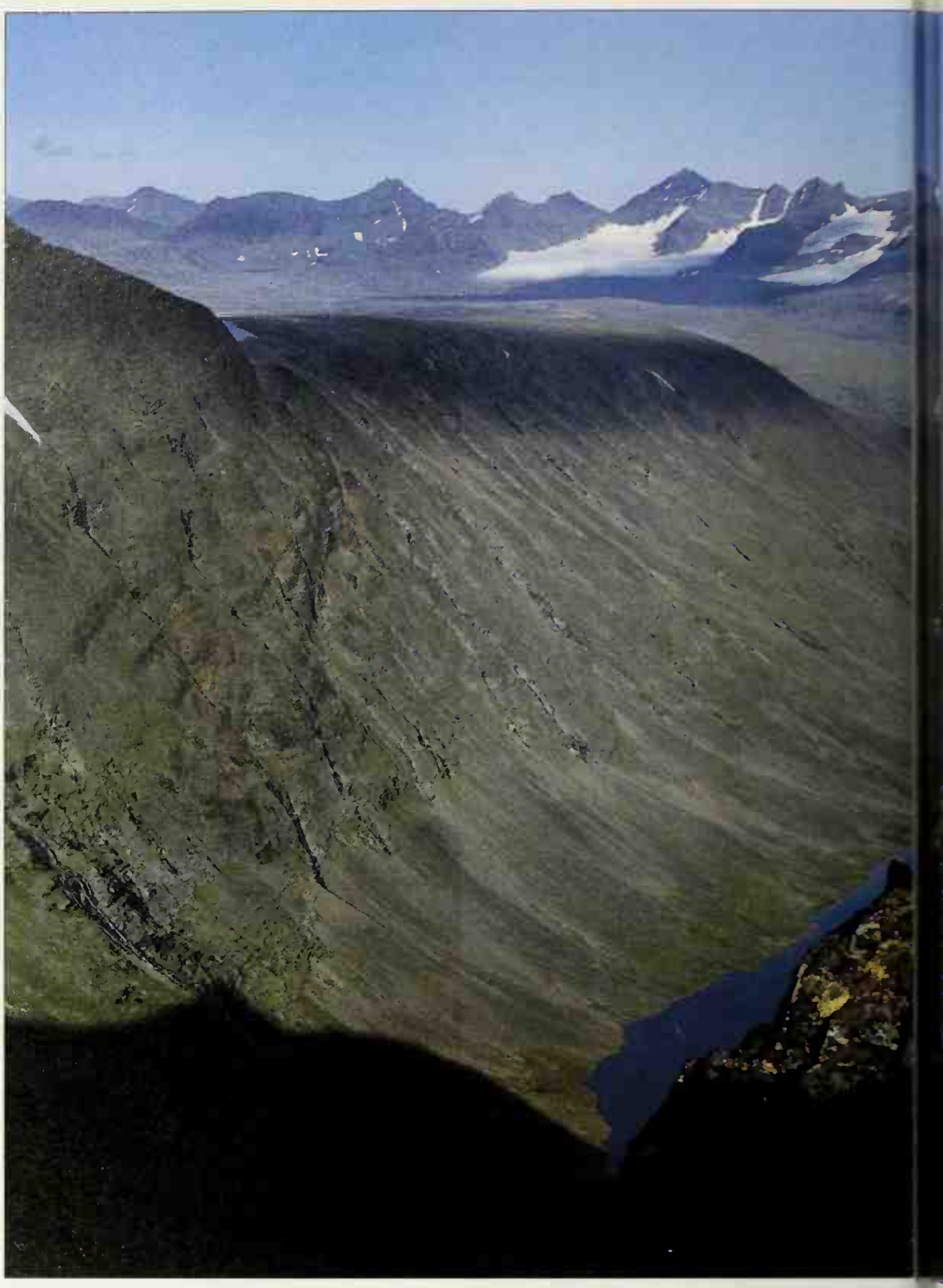
A land of lakes

Sweden and Finland are well known for their lakes. Sweden has 90,000 and Finland 55,000 of them. In the upland areas of northern Sweden the lakes are long and narrow, occupying glacial valleys that have been blocked by moraines. In southern Sweden the lakes are remnants from a time when the area was much lower and completely flooded. The land is still rising as it readjusts following the removal of the great weight of ice that covered it. The many lakes of Finland fill shallow depressions that were made by the ice as it moved over the low shield of ancient rocks. At the end of each cold period of the recent ice age, the ice stopped moving and began to melt. As it did so it split into blocks, and the gaps between them filled with sediment. Once the block was completely melted the sediment around its edges formed the rim to a depression known as a kettle hole. Many of these have filled with water.

ECOLOGY AND CLIMATE IN BALANCE

The forest environments of northern Scandinavia are under threat. Some areas of birch forest on the Lapland plateau have been damaged to such an extent that new, treeless tundra areas may ultimately be formed. The culprits are the larvae of the geometrid moth *Epirrita autumnata*. In its voracious caterpillar stage it strips the leaves of the trees so thoroughly that in one area of 13,000 sq km (5,000 sq mi), 1,200 sq km (460 sq mi) of birch forest were affected.

The damage seems to follow years with a particular combination of climatic characteristics. The summer of 1964 was wet; that of 1965 both wet and unusually cold. The trees were defoliated by the caterpillars in the poor summer of 1965, and consequently lost all their reserves of energy. The following spring they had no buds, and no nourishment for new growth. The same poor summer also reduced the number of parasites of *Epirrita*, so the caterpillars flourished.



ROCKS AND LANDSCAPE

There are three major groups of rock in the Nordic countries. They are the ancient rocks of the shield areas, the old sedimentary rocks of the western mountain ranges (often metamorphosed and mixed with old shield rocks and igneous intrusions), and the younger sediments in the south.

Underlying much of both Sweden and Finland is the Baltic shield, with rocks generally more than 600 million years old. The shield includes metamorphosed rocks, that at 3,000 million years old are among the oldest in the world. There is a great variety of rock types, including granite, slate and other rocks that are very resistant. Evidence has been found of at least one ice age, which occurred some 600 million years ago.

The mountain range along the northwestern edge of the shield comprises old sedimentary rocks and igneous intrusions that were lifted up some 400–350 million years ago during the Devonian period. The folding was so intense that deep down the rocks were metamorphosed; with subsequent erosion, these are now often found at the surface. This area has been so modified by erosion and deposition that the shape of the surface today is completely unlike that of the original mountains, and is but a remnant from this mountain-building period, which affected Scandinavia and also northern parts of the British Isles.

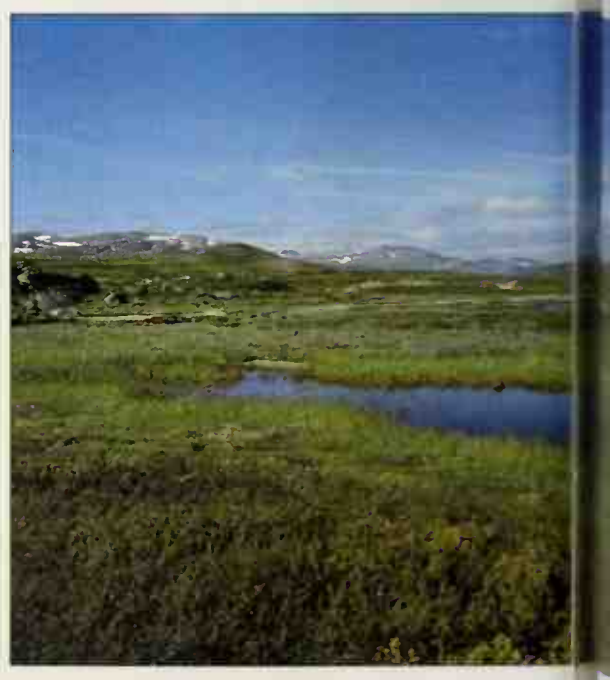
The much younger sediments in Denmark and the south of Sweden (Scania) include sandstone, shale and mudstone and occasionally limestone. These most recent sedimentary rocks, themselves more than 60 million years old, are largely covered by deposits of sand, gravel and clay dating from the last glacial period. Iceland came into being in the Tertiary period (65–2 million years ago), the result of volcanic activity that continues today.

Scenic variety

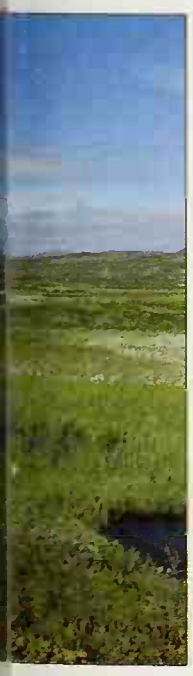
The types of scenery in the region reflect the contrasts between the extremely old geological foundation and the most recent deposits of the past 2 million years, which often lie directly on top of them.

The western mountains occupy much of Norway and of northwestern Sweden. The *fjell* of Norway (*fjall* in Sweden) is a high plateau above the treeline with isolated mountain peaks and deep, steep-sided valleys. The highest peak, Glittertind, rises to 2,470 m (8,104 ft) and is fretted by the effects of glacial erosion. The deep valleys running from the plateau form fjords along the western coast. Parallel to it is a string of some 150,000 rocky islands or skerries, forming a natural breakwater known as the skerryguard. Some of the inner islands rise to over 1,000 m (3,300 ft).

To the southeast, a plateau extends from southern Norway through much of the spine of Sweden into northern Finland. It has a foundation of ancient shield rocks, overlain in part by glacial deposits. The Swedish part of the plateau, Norrland, lies between 200 and 500 m (660 and 1,600 ft) above sea level. It is composed in the north of plains with only isolated



The central spine of mountains that separate Sweden from Norway include those of the Sarek National Park, one of the largest wilderness areas in western Europe. The mountains were scraped bare of soil, and their contours rounded and smoothed, by the ice sheet during the last glacial period, at its height some 18,000 years ago. This area has been protected because of its outstanding natural beauty



The tundra landscape of Stekenjokkfjall in southern Lapland at the height of summer. Lakes have been formed by the melting snow and ice, as the water cannot drain away through the permanently frozen ground beneath the surface. There is a flush of growth as the shrubs and grasses make the most of the short summer season.

ACID RAIN AND ACID ROCKS

In northern Europe precipitation (rain, sleet, snow and mist) has become between 10 and 80 times more acid over the past 30 years. (The popular term acid rain, excluding as it does some forms of precipitation, is not strictly accurate.) The culprits are the sulfur and nitrogen compounds emitted into the atmosphere by fossil-fueled power stations and vehicle exhausts. These emissions can be carried in the atmosphere for hundreds of kilometers before returning to the surface as weak forms of sulfuric and nitric acids.

Other parts of the world are affected by acid rain, among them northeastern North America, Northern Eurasia and Japan. But the Nordic countries are particularly vulnerable to the problems of acid precipitation. Weather systems bring acid pollution from neighboring industrialized countries of Western Europe. The Precambrian rocks found near or at the surface contain no lime or other buffering chemicals to neutralize the acid. As a result water running off or percolating through the surface remains acid and makes the environment more acid. Of Sweden's 90,000 medium- to large-sized lakes, 18,000 have become between ten and a hundred times more acid, and 4,000 of them can no longer provide a habitat for the usual range of species. Large areas of forest have been damaged, and many trees are dying because they are weakened and have become less able to resist disease and attacks from insects.

The problems are made worse because acid water moving through the soil releases poisonous heavy metals such as cadmium, mercury and aluminum that are normally stable. They are taken up by plants, or find their way into watercourses where they damage plants and animals. Fewer nutrients are available to plants as they are also washed out of the soil.

The water moving through the environment is generally most acid in spring, when the snow melts. This delivers a deadly acid surge just at the time that young plants and animals are most vulnerable.

hills; farther south the scenery grades from open mountainside, through plateau country dissected by very active river valleys, to coastal plain.

The lowlands of central Sweden are separated from the northern uplands by a massive fault. The landscape of this lake district has been created by the splitting and faulting of the rocks, and the shapes of large lakes follow the pattern of these tectonic lines. There is a similar landscape in the southern part of Finland.

The uplands in southern Sweden are a gently tilted plateau of older rocks about 100 m (330 ft) above sea level and overlain by extensive glacial deposits. The lowland areas to the south occupy the whole of Denmark and the southwestern corner of Sweden.

Two types of landscape dominate Jutland (mainland Denmark). In the west much of the landscape is underlain by old glacial deposits, with intervening plains of gravel, sand and silt broken up by the old meltwater channels. Its sand beaches are the largest in Europe. The rest of Jutland has recent moraines forming a low hill country, and flat areas where the best farmland is found. Lakes fill depressions, while old tunnel valleys from the most recent period of glaciation cut through the countryside.

Scenery on the islands to the east of Jutland echoes these landforms, with sand dunes and marshes on the coasts and flats and other glacial features inland. An exception is the island of Bornholm off the south coast of Sweden, which is underlain by granite with a thin cover of glacial deposits.

The Finnish lake plateau averages about 100 m (330 ft) above sea level, and is scattered with innumerable lakes. In Finland one-tenth of the land surface is covered by lakes, and in the southeast lake water occupies more than a quarter of the surface. In the north and toward the coast more than three-fifths of the land surface consists of peat bogs. This landscape is very new. Since the ice receded there has not been enough time for a drainage system to become established, so there is much surface water, conditions in which lakes and bogs thrive. The Bothnian lowlands, inland from the shores of the Gulf of Bothnia, have also been affected by a rise in the level of the land, and old beachlines can be traced on the low-lying plain.

By contrast, the Faeroe Islands are underlain by basalt, while Iceland is mainly a bowl-shaped highland with coastal mountains and plateaus 500–800 m (1,650–2,600 ft) high in the interior.

The rising land

In 1621 Erik Sorolainen, bishop of the port of Turku in southwest Finland, predicted that the Day of Judgment was at hand. He cited as evidence the fact that the land was not stable after all, but rising. All round the shores of the Gulf of Bothnia harbor towns were rising and ports becoming unusable. At Pori, 120 km (75 mi) north of Turku, the harbor had to be moved seaward six times in as many centuries because it silted up as rivers cut through the rising land. At Vaasa, farther north, at the narrow "waist" of the gulf, where the land is still rising 87 cm (34 in) every hundred years, the port had to be moved to Vaskiluoto. Each year Finland gains 10 sq km (4 sq mi) of territory from the sea.

Like the Canadian Shield around Hudson Bay, the land around the Gulf of Bothnia is rising as a consequence of the melting of a great ice sheet that covered the land in the most recent glacial period. A depth of 3 m (10 ft) of ice has sufficient weight to depress the underlying land by 1 m (3.3 ft). It has been calculated that 2,000 m (6,500 ft) of ice depressed the land of Nordic countries by 600 m (2,000 ft).

After the ice sheet melted the land began to rise, at first by as much as 9 cm (3.5 in) a year in some areas. It can take between 15,000 and 20,000 years for the land to regain its equilibrium (isostasy). This readjustment began to take place 13,000 years ago. The rate at which the land is rising has declined ever since, but at the head of the Gulf of Bothnia it is still rising at 1 cm (0.4 in) a year.

It is not easy to distinguish the rise of the land from the effects of the rise of the sea (eustasy), but a series of stages has been identified using the evidence of former shorelines. Throughout Scandinavia there are shoreline features at levels often well above the present sea level. These old shorelines have beach ridges with remains of mollusk shells, driftwood and peat.

A history of the Baltic Sea

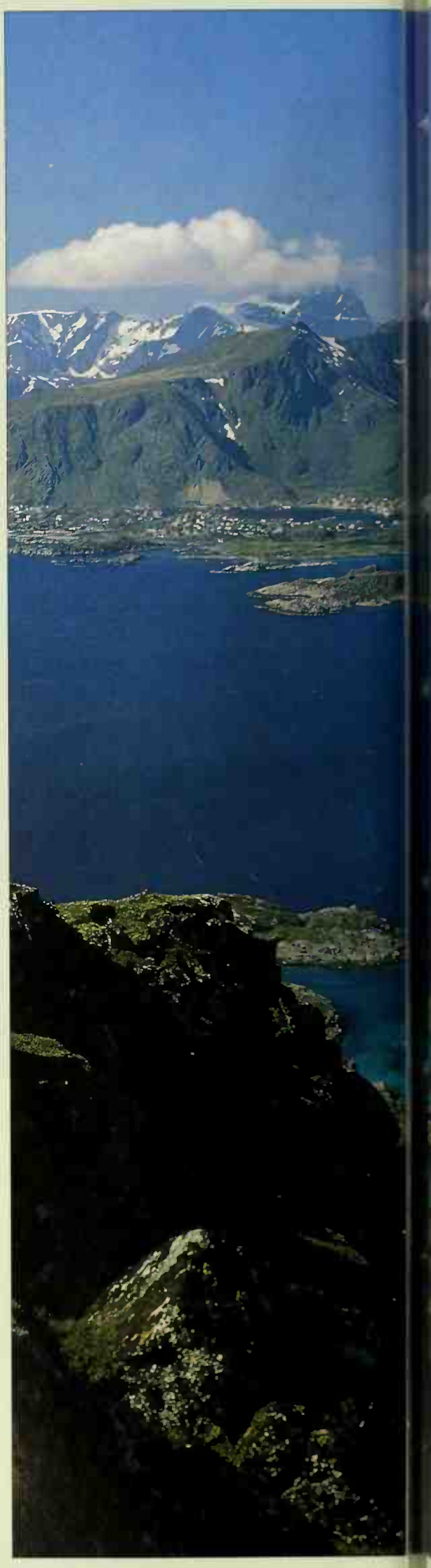
Because of the pattern of drainage, with the watershed in the mountains near the west coast of Norway, most of the water released as the Scandinavian ice sheet melted drained southeast into the Baltic. The Danish islands and the peninsula of Jutland created a dam across the Baltic Sea. Combined with rises in the land and in the sea level this produced a sequence of lakes and seas that were the ancestors of the present Baltic Sea.

Mollusk shells found in the high-level deposits have provided particularly important markers in reconstructing the sequence. *Yoldia arctica*, a saltwater species, *Ancylus*, a freshwater snail, and *Littorina*, a saltwater snail, have each given their name to one of the stages.

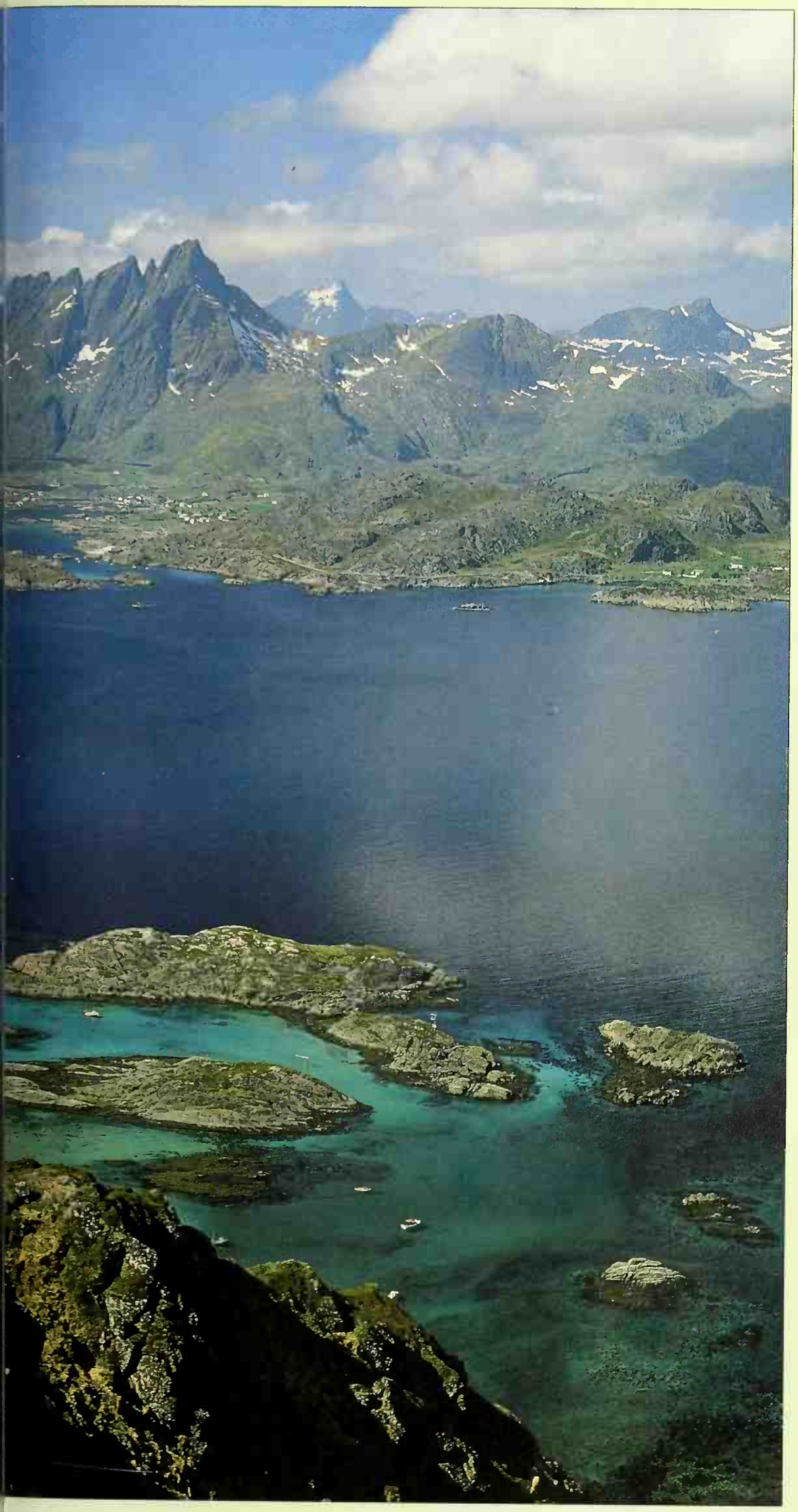
The freshwater Baltic Ice Lake formed between 10,500 and 10,200 years ago and was initially separated from the North Sea. At that time the ice sheet still covered a large area, and the rate at which the land rose was not great. When the ice sheet began to melt more quickly, the volume of meltwater in the Baltic Ice Lake basin increased and gradually overflowed into the North Sea through central Sweden.

This marked the beginning of the Yoldia stage, which lasted from 10,000 to about 9,500 years ago. The land was now rising at its fastest, and more rapidly than the rise in the level of the sea, so the Yoldia Sea was succeeded by the inland Ancylus Lake, which lasted until nearly 7,500 years ago. The Littorina Sea, the immediate ancestor of today's Baltic Sea, was formed when the sea flooded through the channels that had been created by meltwater in what is now Denmark.

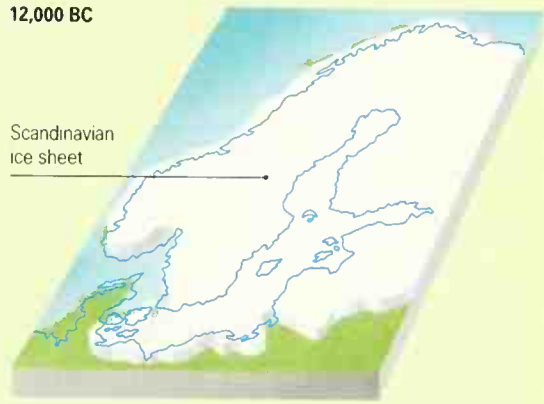
Blue lakes and evergreen forests cover the lakeland plateau area of Kuopio in south-central Finland. The ancient shield rock was eroded by the advancing ice sheets, leaving hollows and glacial deposits when they retreated. Since then the land has slowly risen; it now rises at a rate of about 1 cm (0.4 in) a year.

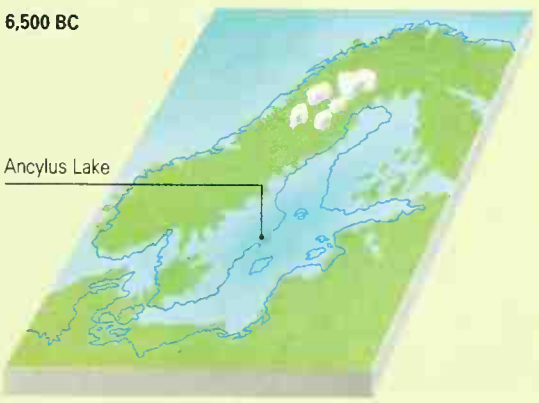


The Lofoten island group off the northwest coast of Norway was one of the first areas to be exposed when the ice sheets began to melt. The coastline has changed since then, as the sea level has risen and more of the once depressed land has gradually emerged.



The retreating ice The Scandinavian ice sheet was at its greatest extent about 18,000 years ago, when it covered northern Europe. By 12,000 BC the ice was retreating, 10,000 years ago the northwest coasts and the southern shores of the ice-blocked Baltic Ice Lake were exposed. Further melting led to the lake joining the North Sea. As the land continued to rise following the retreat of the ice the Ancylus Lake was formed. By this time the only remains of the ice sheet lay in northern Norway. As the land recovers from the weight of the ice that covered it for thousands of years during the recent ice age, its outlines gradually change.



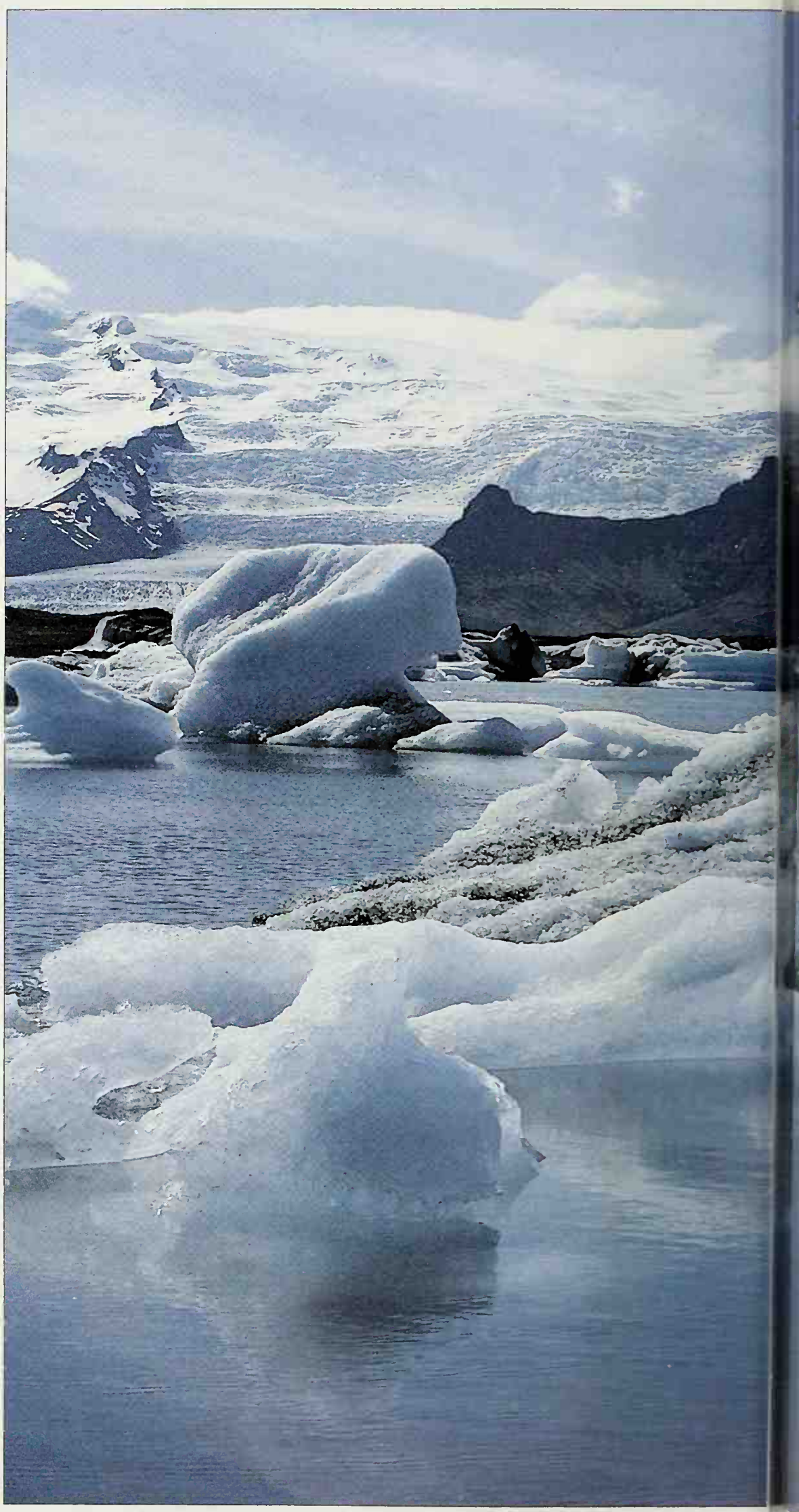


Land of ice and fire

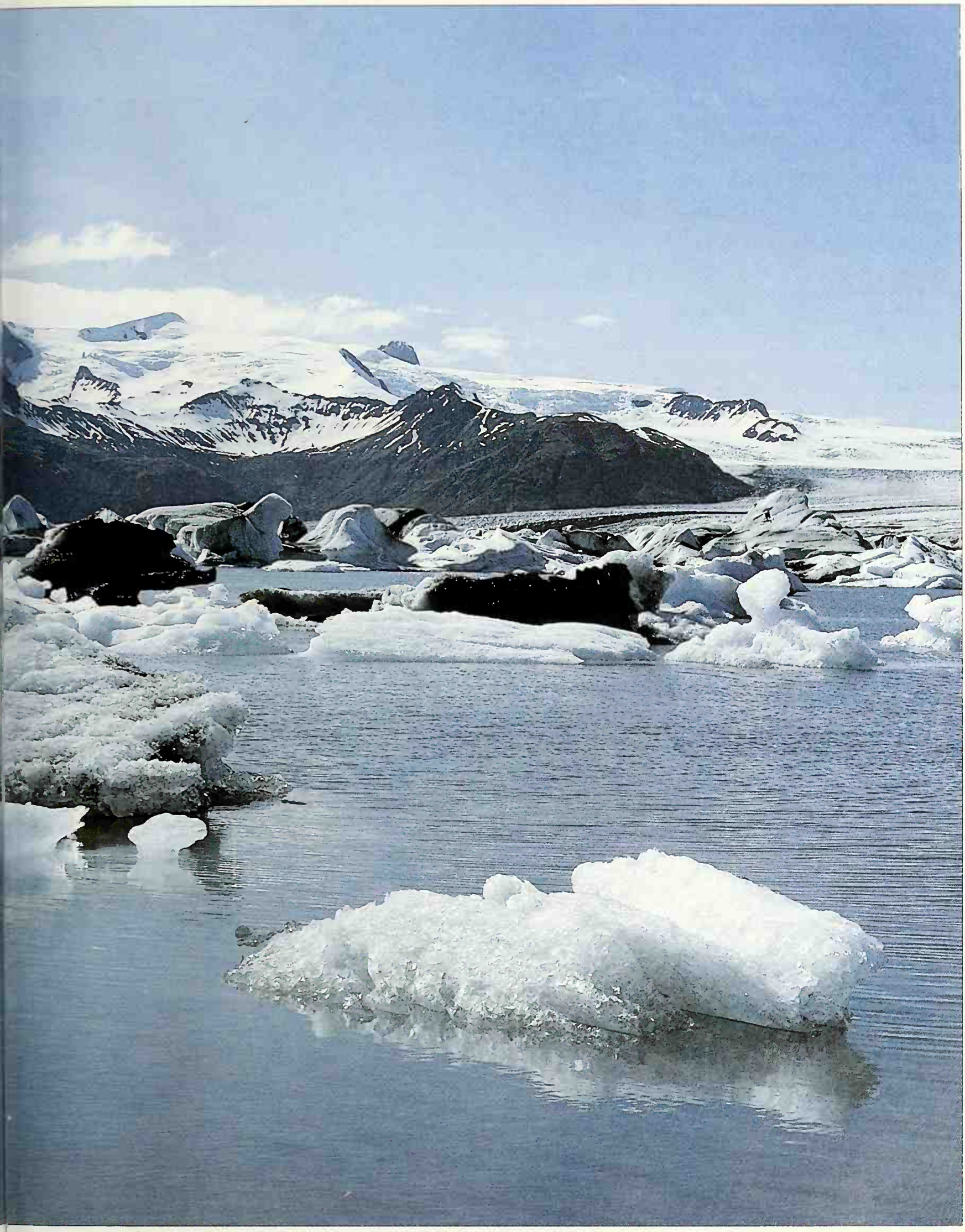
The icy landscape of Iceland's Vatnajökull (*vatna*=water, *jökull*=glacier) belies the country's volcanic heart. This active volcanic island with its cold subarctic climate has a unique blend of landscapes.

Vatnajökull is Europe's second largest ice sheet. It stretches over 8,538 sq km (3,296 sq mi) in the southeast of Iceland. In places it rises to over 2,000 m (6,560 ft), and the ice can be as much as 1,000 m (3,300 ft) thick. Volcanic hotspots under the ice sheet cause the ice to melt, creating large lakes and rivers. Occasionally, the volcanoes erupt and send streams of water, ice and boulders cascading over the surrounding landscape. These floods are known as glacier runs or *jökulhlaupav*. Iceland is well known for its thermal springs and geysers, which are often found side by side with the glaciers themselves. They provide a source of heat for the Icelanders in a country that has no other natural sources of energy to combat the cold conditions.

Volcanic activity is associated with Iceland's location on the northern edge of the Mid-Atlantic ridge. Along the ridge new crust wells up as the North American and Eurasian plates of the Earth's surface layer – the lithosphere – move apart, a process known as sea-floor spreading. Occasionally this activity forms new land above sea level. Iceland was formed in this way, and new islands are still appearing. As recently as 1963 the island of Surtsey was thrust out of the sea off the south coast of Iceland in a fiery eruption.



The frozen landscape of Vatnajökull in Iceland covers a fiery, volcanic subterranean world.



HABITATS AND THEIR CONSERVATION

WILDERNESS OF THE NORTH · A WELL-PROTECTED REGION · THREATS FROM AFAR

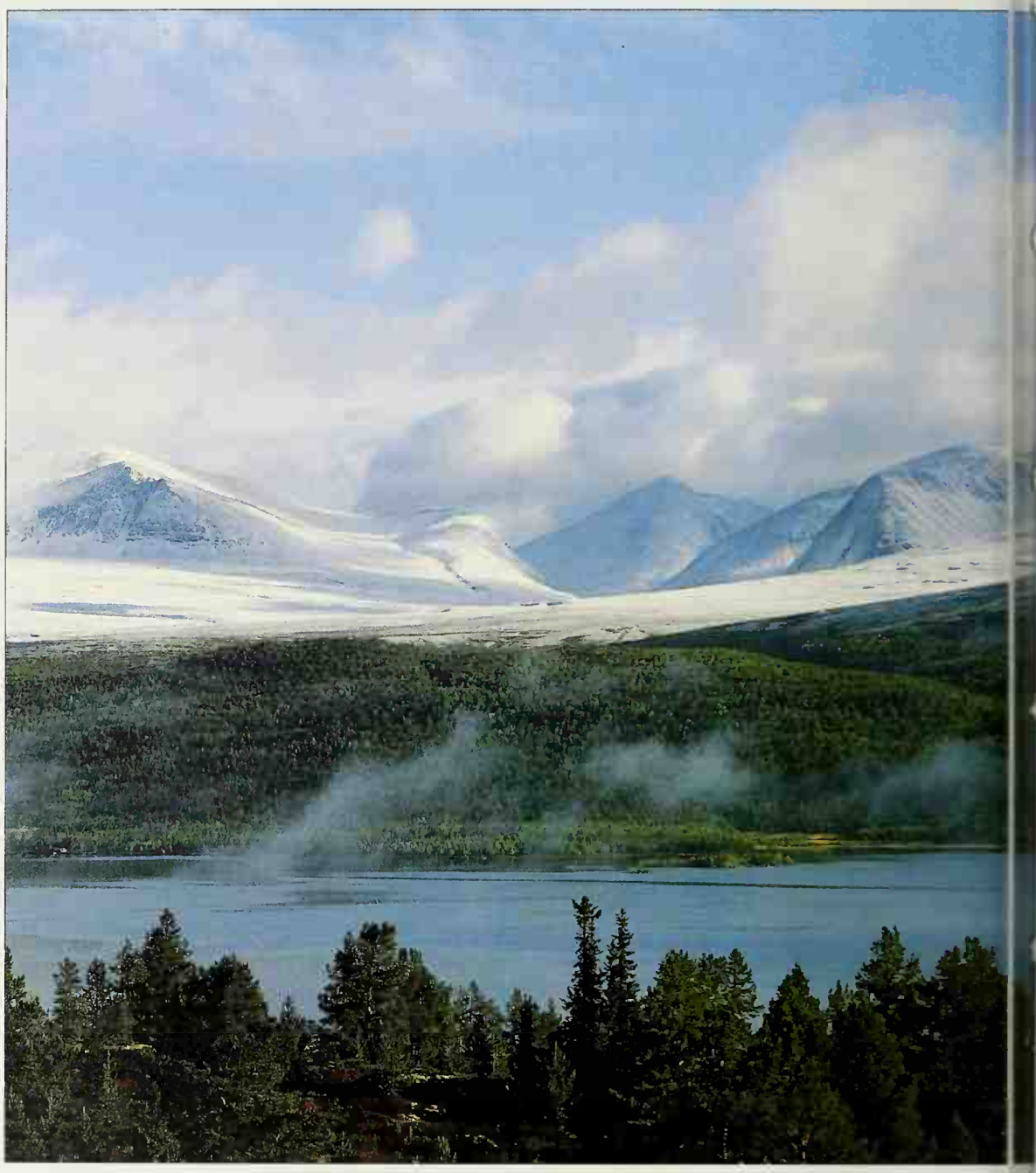
The Nordic countries contain some of the largest wilderness areas in Europe. Extending far beyond the Arctic Circle, yet warmed on its western shores by the North Atlantic Drift, the region lies at the western limit of the taiga, the great, unbroken coniferous forest that stretches to Siberia and is home to the wolf, wolverine, brown bear, lynx and moose. The sparkling lakes and bogs of Finland and northern Sweden are the summer breeding homes of millions of waterfowl and waders. Norway's rugged coast supports a profusion of underwater life. Away from mainland Europe volcanic Iceland has its own unique landscapes; huge numbers of seabirds nest on the cliffs of the Faeroe Islands; and the polar desert of Svalbard in the Arctic Ocean is inhabited by one of the world's largest polar bear populations.

COUNTRIES IN THE REGION

Denmark, Finland, Iceland, Norway, Sweden

Major protected area	Hectares
Abisko NP BR	7,700
Børgefjell NP	108,700
Breidafjördur NR	270,000
Dovrefjell NP	26,500
Femundsmarka LPA NP	38,600
Hardangervidda NP	342,800
Lemmenjoki NP	280,000
Muddus NP	49,300
Myvatn Laxá NR RS	44,000
Northeast Svalbard NR BR (Svalbard islands)	1,903,000
Øvre Anarjäkka NP	139,000
Øvre Dividal NP	74,100
Padjelanta NP	198,400
Pallas-Ounastunturi NP	50,000
Rogen NR	41,166
Rømø Island NaP	12,100
Rondane NP	57,200
Sarek NP	197,000
Sjaunja NR RS	290,000
Skaftafell NP	50,000
Skagen NR	4,300
Stora Sjofallet NP	127,800
Thingvellir NP	4,200
Urho Kekkonen NP	253,000

BR=Biosphere Reserve, LPA=Landscape Protected Area, NaP=Nature Park, NP=National Park, NR=Nature Reserve, RS=Ramsar site



Forest and ice Snowcovered mountains rise above the forest and lakes of Norway's Rondane National Park, which lies within the subarctic taiga zone of coniferous forest. On the northern fringes of the taiga, and at altitudes where the trees become scattered and more open, lichens predominate among the ground cover, and are grazed by herds of wild reindeer

An old beech tree is covered in mosses, ferns and a bracket fungus, providing food and shelter for many kinds of insects. Deciduous woodlands like this cover much of southern Sweden and Norway, gradually merging with the northern coniferous forests on the lower slopes of mountains and in sheltered valleys. The one shown here is of beech and rowan. Sunlight penetrates between the young saplings, allowing ground cover to develop

WILDERNESS OF THE NORTH

Northern Scandinavia (Norway, Sweden and Finland), which is largely unpopulated, still contains significant areas of unspoilt wilderness. Above 1,000–1,200 m (some 3,300–4,000 ft) there are glaciers and patches of permanent snow, rocky peaks and block screes, a hostile land almost bare of vegetation. Below the exposed peaks lies a treeless, windswept landscape of heaths and low-growing willows, the mountain tundra, which leads down to a treeline of scattered birch trees, outliers of the birch forest that occupies most alpine valleys in Scandinavia and all mountain slopes up to 500–800 m (1,600–2,600 ft) above sea level.

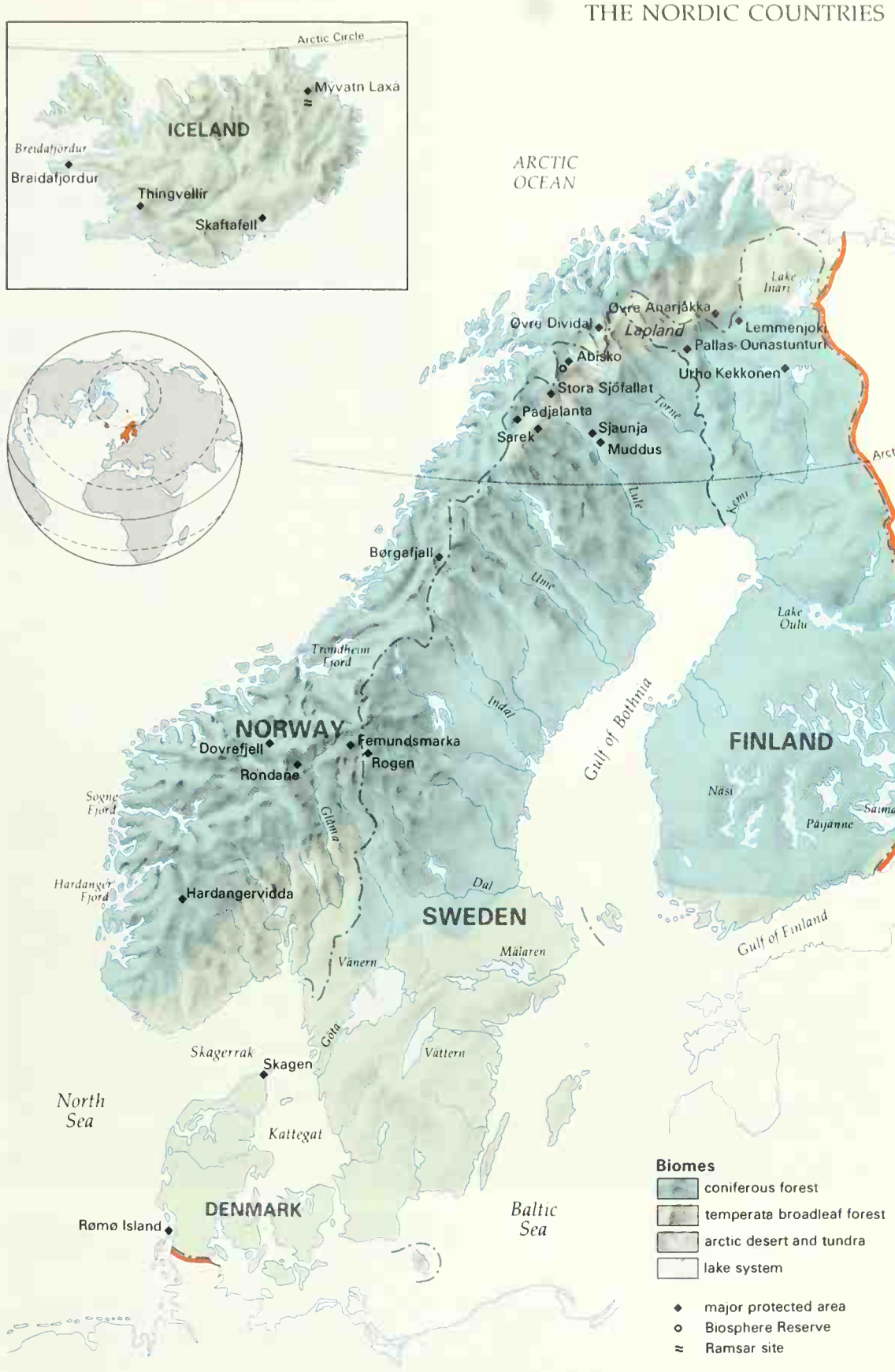
At lower levels the birch forest gradually merges into the boreal forest or taiga, an enormous and rather uniform area of dark coniferous forest, sometimes hilly, sometimes flat and interspersed with bogs and lakes. Scots pine dominates on coarse soils and bedrock, and spruce on richer soils. Mixed in with the conifers are deciduous trees such as birch and alder. Despite widespread logging there are still significant areas of protected virgin forest in parts of northern Sweden and Finland, especially in the mountains.

Lakes and bogs are widespread on waterlogged ground, their abundant insect life attracting millions of migrant birds in summer. Here are some of the last nesting grounds of the red-throated loon or diver, whooper swan and bean goose. Peregrines breed on treeless bogs; ospreys fish in the lakes, nesting in nearby trees.

The southern forests

The southern limit of the taiga, around 60°N, is also the northern limit of oak. On the lower slopes of the mountains, in sheltered valleys and in the warmer south the coniferous forest gradually merges into deciduous temperate forest. A mixed forest of coniferous and deciduous trees is found throughout much of southern Sweden and in small areas of southern Finland and Norway. With their great variety of nuts and seeds, these mixed forests support a rich birdlife, as well as numerous species of small mammals, deer, foxes and badgers.

True deciduous forest, characterized by beech, oak, elm and ash, covers southernmost Sweden and a small area in southern



Map of biomes Temperate broadleaf forest merges into the taiga coniferous zone within the Nordic region. Its numerous lake systems are threatened by acid rain. Iceland has sparse tree cover and peat bogs, which are covered in snow and ice in winter.

Norway, as well as 10 percent of Denmark. Although rich in species, very little of this forest is completely untouched by human activity. Altogether, 30 percent of Norway, 55 percent of Sweden and 65 percent of Finland is covered in forest of one type or another.

In the south, the deep deposits of material deposited by melting ice sheets at the end of the last ice age have formed a rich soil, and a gentler agricultural landscape dominates. Denmark's sandy coast, with its mudflats and lagoons, attracts waders, ducks and geese.

Islands of the far north

The northern islands are quite different from the rest of the Nordic countries. Their isolation and unique past have given each its own character.

Iceland's landscapes are a unique blend of polar snow and ice, extensive peat bogs and volcanic deserts. There is continuous vegetation cover over only a quarter of the island. The only natural forest in this windswept land is birch. Foxes were the only land mammals here until humans

introduced domestic species, including reindeer, and accidentally brought in rats and mice; there are no amphibians or reptiles. But the richness and variety of the birdlife more than compensates for the lack of other vertebrates.

The treeless, windswept Faeroe Islands in the north Atlantic have no indigenous mammals, but the seabirds nesting on the cliffs are so numerous as to provide a source of income from food and feathers for the local people.

A lakeland paradise for birds Lake Mývatn in Iceland is named after the mosquitoes that swarm over the surrounding countryside in the summer. Biting insects are a scourge throughout this region, but provide an important source of food for birds and fish. Mývatn is famous for the rare species of ducks it supports.

A WELL-PROTECTED REGION

The Nordic countries were among the first to practice modern conservation, and today they boast one of the most sophisticated conservation systems in the world. Conservation considerations are closely integrated with land use planning, and "green" issues have come to dominate the decision-making political scene.

Some of the earliest conservation legislation was passed in Sweden in 1909 in the form of a conservation law that established the first nine national parks in Europe. Denmark followed suit with a conservation law in 1917, Finland in 1923 and Iceland in 1928. Today it is a general principle in these countries that all species of wild birds and mammals not scheduled as game are protected.

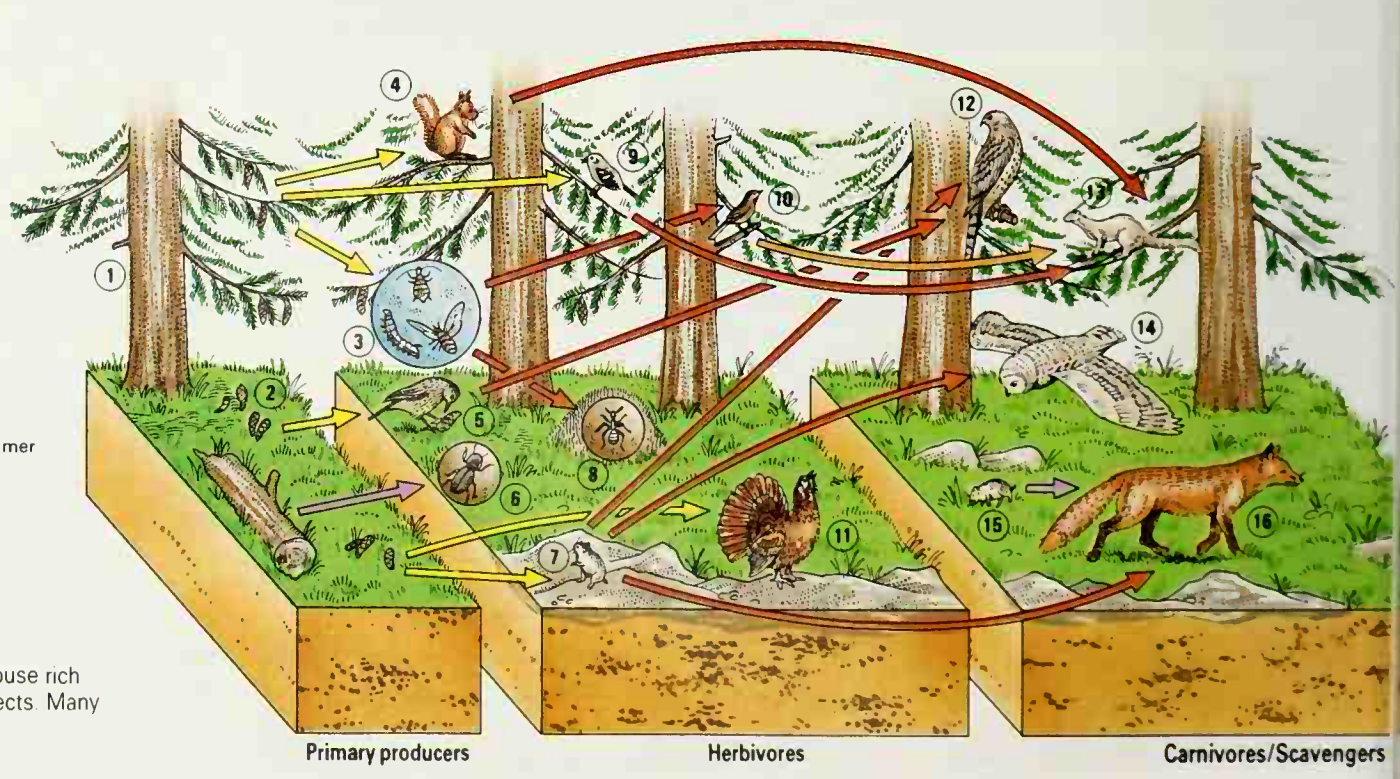
Since this early start, protected areas have increased in number. The largest and most scenic are usually the national parks, but their numbers are not a reliable indication of the degree to which nature is protected. Nature reserves are more numerous than national parks: Sweden, for example, has some 1,360 nature reserves but only 20 or so national parks. Denmark has no national parks at all, but a quarter of the country is covered by nature parks in which town and country planning controls safeguard habitats: building, digging and planting are forbidden within 300 m (1,000 ft) of forest fringes and 100 m (330 ft) of ancient monuments.

Game reserves, where both hunting and public access are regulated, are widespread in Scandinavia, often affording considerable protection to wild species. The nature reserves protect specific sites of aesthetic, scientific and recreational value, or the breeding sites of birds and mammals. Sometimes specific habitats are protected as well.

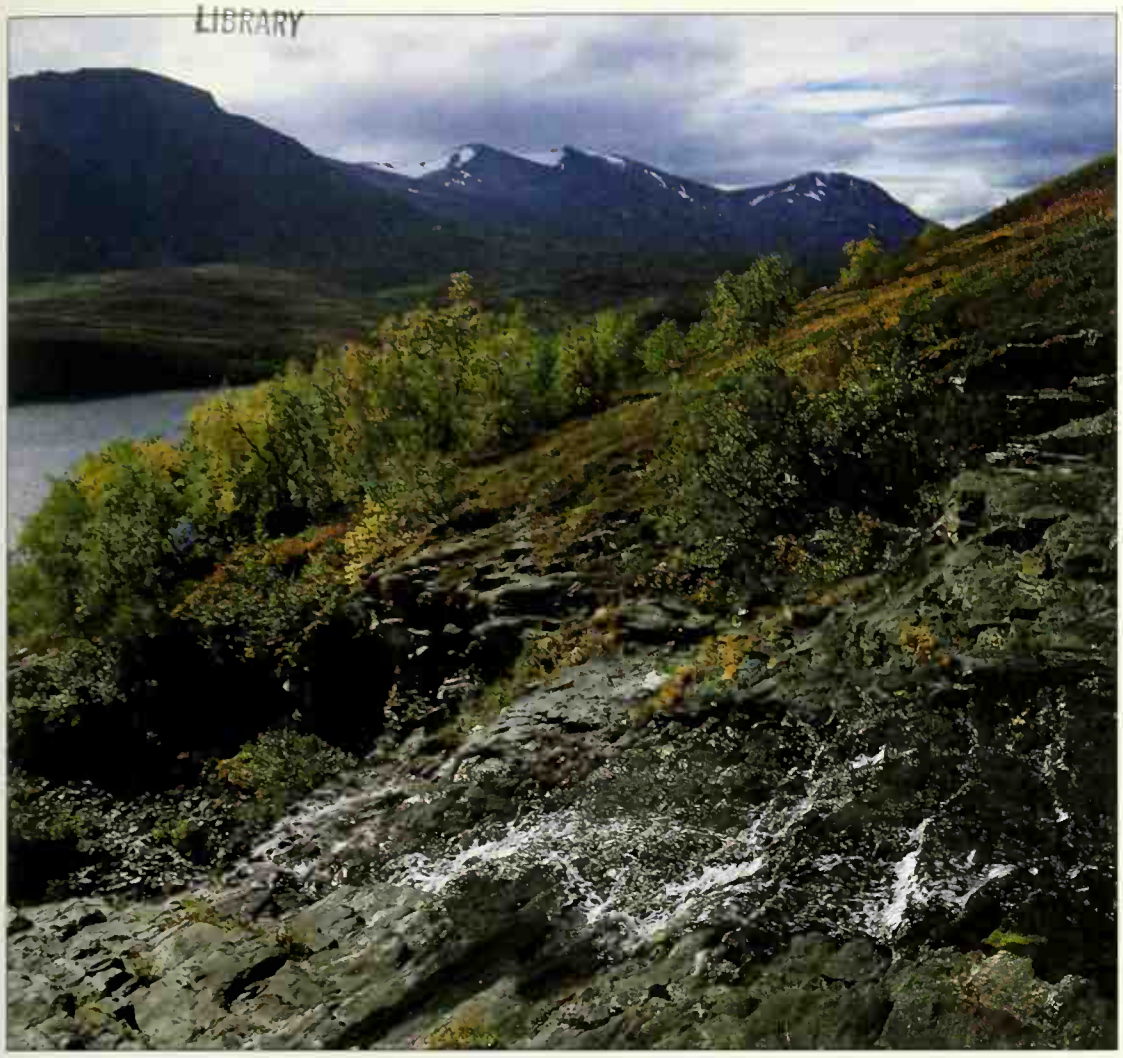
A further category of natural monuments protects smaller features, such as waterfalls, clumps of trees and, in Iceland, volcanoes and hot springs. Special reserves may also be created to protect ecosystems under particular pressures, such as Finland's fragile peatlands and

Components of the ecosystem
1 Pine, spruce, fir, larch trees
2 Fallen cones, seeds, needles
3 Aphids, beetles
4 Red squirrel
5 Nutcracker
6 Bark beetle
7 Northern red-backed vole
8 Red ant in nest of pine needles
9 Pine grosbeak
10 Siberian tit
11 Western capercaillie
12 Goshawk
13 Pine marten
14 Gray owl
15 Dead vole
16 Red fox

Energy flow
- primary producer/primary consumer
- primary/secondary consumer
- secondary/tertiary consumer
- dead material/consumer



A taiga ecosystem Dead logs house rich communities of decomposer insects. Many other animals live seasonally in the forest.



Protecting the remote wilderness Sjaunja Nature reserve in the north of Sweden has been added to the region's extensive network of protected areas because the shores of its lakes make it an important feeding and breeding site for many species of northern birds.

bogs. Sweden's Nature Resources Act specifically protects several important and unspoiled river systems against hydroelectric power developments, and also safeguards 12 very large, roadless and uninhabited mountain districts against commercial exploitation.

In the Nordic countries the right of public access to the land is almost universal, but transport may be regulated. In fragile environments the use of snow scooters and other motorized vehicles is often prohibited within national parks and reserves, and sea and river traffic may be restricted near breeding birds.

The Nordic countries' plethora of reserves is well justified, for much of the region's wildlife heritage is of international importance. Many wetland areas have been designated as Ramsar sites under the international convention of 1971 – 38 in Denmark (11 of these in Greenland), 30 in Sweden, 14 in Norway, 11 in Finland and 1 in Iceland. There are also a number of Biosphere Reserves, set up to protect significant examples of particular habitat types. These include the tundra and polar desert areas of the Svalbard archipelago, and the Abisko Biosphere Reserve in the area of Lake Torne in Sweden. Although all the Nordic countries except Iceland are party to the World Heritage agreement, no natural wilderness site has yet been designated in the region.

A unique blueprint for conservation

The Nordic Council, to which all the countries of the region belong, is pioneering a system for assessing the importance of various sites for conservation. This complex system of classification recognizes 76 geographical regions and some 600 types of vegetation. It takes into account such factors as the nature of the bedrock, the soil, plant and animal communities, current land use and the history of modification by human activity. Devising such a system has involved many new surveys. These will provide an invaluable environmental data base.

This information will be used not only to identify sites that are worthy of protection, but also to assess the ability of the local environment and natural resources to withstand various types of exploitation, such as industry and urbanization, agriculture, forestry and recreation. The data will also aid planners in finding suitable sites for reservoirs and the regulation of water flow.

A place for the people

In some places there is a conflict between the interests of wildlife and habitats and those of local people and visitors. Many people living in the country are suspicious of regulations against hunting, snowmobiles, overflying and fishing, and the nomadic reindeer-herding Lapps still retain the right to practice their traditional way of life in some conservation areas. Tourists can damage vegetation as, for example, in Sweden's Sarek National Park, where the bogs are easily destroyed by trampling feet. Conservationists must strike a balance between protecting the environment from harm, and providing opportunities for people to enjoy the wilderness alone and in peace.

MÝVATN AND LAXÁ NATURE CONSERVATION AREA

Public outcry greeted the proposal to turn Iceland's Lake Mývatn into a reservoir for hydroelectric power. As a result of this strong opposition, a special protected area, covering at least 44,000 ha (108,600 acres), was established in 1974 by act of parliament.

Lake Mývatn is one of the island's largest lakes. It is very irregular in shape, quite shallow and extremely rich in birdlife. Vast numbers of midges and blackflies breed here, providing an important source of food for fish and birds. All 15 species of Icelandic ducks breed here, between 8,000 and 9,000 pairs, a number that includes the entire European population of the Barrow's goldeneye.

The lake is studded with volcanic islands and surrounded by hot springs and old craters. When the explosion crater of Hverfjall was created, lava dammed the lake. Its outlet river, Laxá, still follows the course of an old lava flow. Steam erupting through molten volcanic rock has created a fascinating scenery of sculpted lava.

The main conservation aims for Lake Mývatn are to prevent its exploitation for hydroelectric power, and to control building and environmental disruption in the surrounding area, which has been settled for centuries. There are several farmsteads, and one small village, Reykjahlid, has grown up to service a diatomite factory. Diatomite, used as a filter material, is made from the skeletal remains of minute algae (diatoms). The method of extracting the raw material is a cause for concern among conservationists, as it involves dredging the muddy bottom layers of the lake, upon whose productivity Lake Mývatn's wildlife depends.

THREATS FROM AFAR

The most serious threat to the plant and animal life of the Scandinavian wilderness is the airborne acidification of land and water. Toxic chemicals, discharged from industries and cars, disperses over great distances. In Nordic countries such pollutants, which increase the acidity of the rain, snow, sleet and mist, mostly originate in other western European countries, and the heavily industrialized Soviet Union in the east.

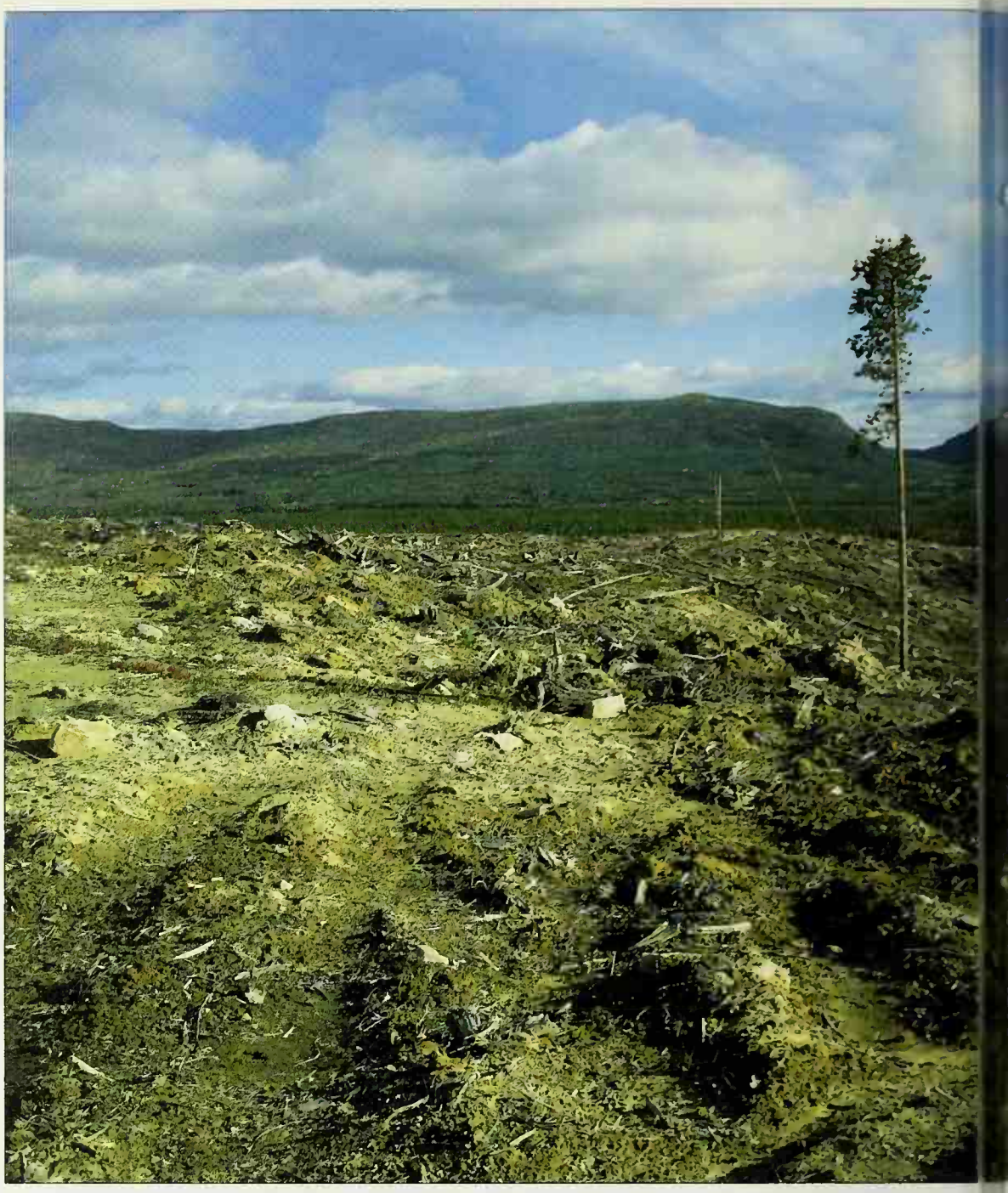
The major contributors to acid rain are oxides of sulfur and nitrogen, which dissolve in rainwater to form weak acids. In some remote places, whether protected or unprotected, high acidity and contamination by poisonous heavy metals have been found. The great wilderness area of the Rogen Nature Reserve in Sweden and the neighboring Norwegian Femundsmarka National Park are so badly polluted that lime has had to be spread in the lakes to counteract the acidity. In southern and central Sweden the fisheries of some 18,000 lakes are now affected, as the increased acidity leads to high egg and fry mortality.

Other sources of water pollution include effluent from factories and farms, and pesticide residues. During the last 80 years the concentrations of phosphates and nitrogen compounds in the Baltic Sea have increased tenfold, affecting the breeding success of seals, sea eagles and salmon. The fish of many lakes are poisoned by mercury, cadmium and other heavy metals; this has contributed to the almost total disappearance of the otter from southern Sweden.

The mountain forest battle

The decision of Sweden's state-owned forestry company in 1980 to do away with its voluntary logging boundary in the mountains of Swedish Lapland surprised many people. These areas of high altitude were supposed to be unsuitable for reforestation, but the company claimed that new methods had now made this economic. Conservationists became very worried, and the authorities began to compile an inventory of virgin forests – forests untouched by human hand. It revealed that Sweden had the largest area of virgin coniferous forest in Europe.

Voluntary organizations then mobilized public opinion, and the conflict was taken



SVALBARD – A POLAR WILDERNESS

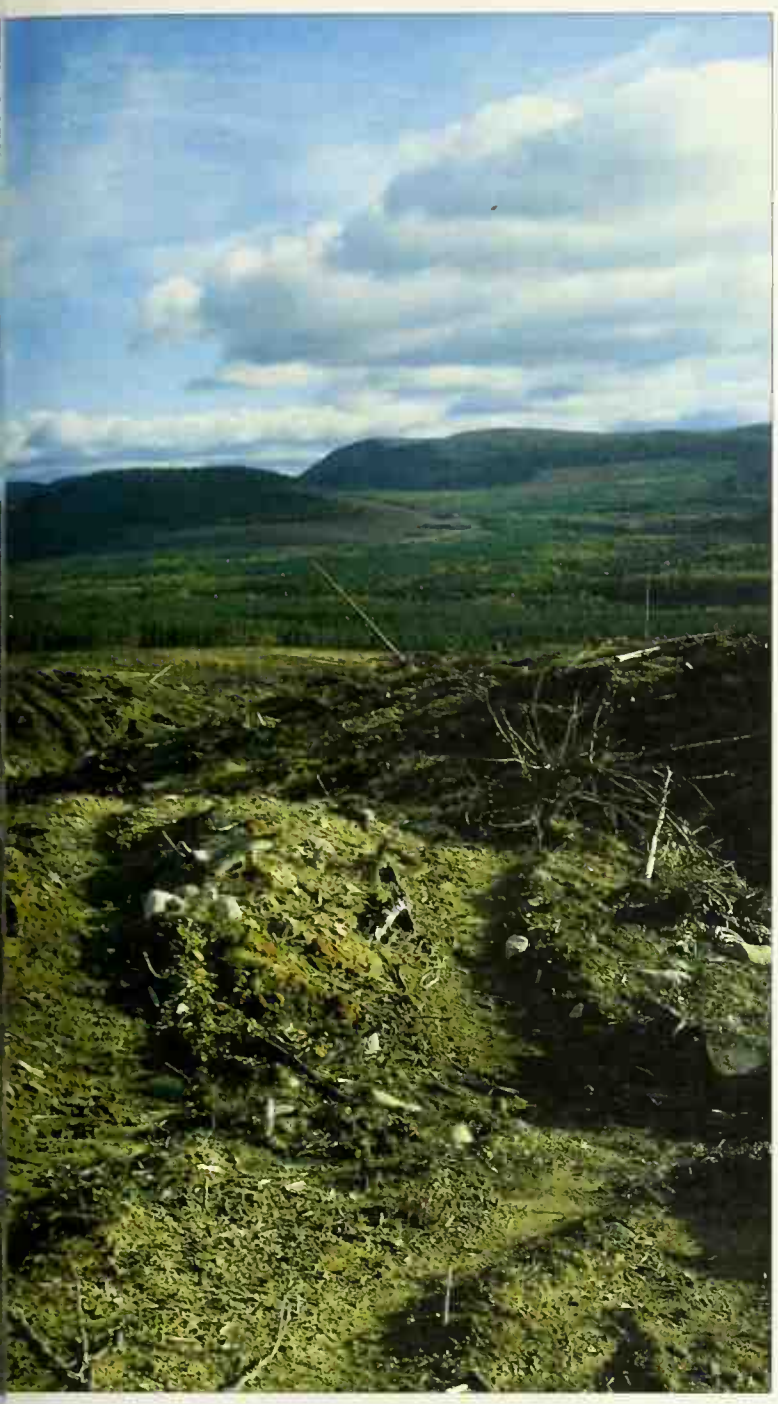
On the edge of the Arctic Ocean lies the Svalbard island group, covering some 62,000 sq km (24,000 sq mi) of polar desert, bare rock and ice, and windswept tundra. In winter the islands are linked by sea ice. Thousands of waterfowl and waders breed here in spring, and large numbers of seabirds nest on the cliffs. Ringed and bearded seals, walrus and belugas (white whales) hunt offshore; arctic foxes and herds of native reindeer live on the islands. Svalbard is most famous because one of the world's largest denning areas for polar bears is to be found here.

These polar habitats are very fragile. Only a thin surface layer of soil thaws in summer, and the waterlogged vegetation is easily damaged by the trampling of feet and by vehicles; in such low temperatures regeneration is very slow. Trash rots extremely slowly, and may take decades to disappear.

Svalbard has large deposits of coal. The islands belong to Norway, but are controlled by an international treaty between Norway and the Soviet Union. Three national parks, 2 nature reserves and 15 bird sanctuaries were established in 1973, covering 45 percent of the land area. The Northeast Svalbard Nature Reserve has since been designated a Biosphere Reserve.

Throughout the islands vehicles are forbidden on any thawed ground, with or without vegetation cover, and the dumping of waste into the sea is not allowed. Harvesting from the sea bed and diving are forbidden. Aircraft and boats need permission to approach the reserves, to avoid disturbing nesting birds. The location of hostels, hotels and mining and exploration installations is strictly controlled. Any disturbance to wildlife is illegal.

Svalbard is a welcome example of international cooperation that enables natural resources to be exploited while at the same time protecting an unspoiled wilderness.



A devastated landscape Logging is an important industry in Nordic countries but large areas of cleared forest are almost useless for wildlife

Reindeer graze in a birch forest The international nature of environmental problems was highlighted when herds of reindeer in Scandinavia were affected by fallout following the explosion at the Soviet nuclear power plant at Chernobyl in 1986

Threatened river life Disruption of the water flow by hydroelectric power schemes has had a serious impact, it is one of the most damaging environmental problems facing the northern wilderness

to the Swedish government, which decided to designate 55 of these areas as nature reserves. This was one of the greatest victories conservation has ever had in Sweden, but some of the old mountain forests that are not classified as virgin forests remain at risk. These forests are important components of the scenery and of the local ecosystem, and Sweden's Nature Protection Association is pressing for a new boundary based on ecological considerations, above which no forestry should be allowed.

Protecting the natural resources

A major task for conservation authorities in Scandinavia is to stop resource exploitation in wilderness areas, especially forestry, mining and hydroelectric power installations. Powerful interest groups can sometimes overcome legal protection. Only four of Sweden's major river systems have escaped damming for electricity generation, and these remain at risk despite so-called protection. The increase in hydroelectric power results from the decommissioning of nuclear power plants following public pressure: the shortfall in energy production must be made up. In Norway there was a long battle over the spectacular Svartisen area lying on the Arctic Circle, which was proposed for national park status as early as 1936. However, its potential for hydroelectric power delayed action being taken for years. It has since achieved this status.

Logging is of vital importance to the economies of the Scandinavian countries. But the creation of large felled areas have spoiled the scenery and habitats in many areas, especially in Sweden and Finland. Despite legislation that requires consideration of the environment, old wood is removed and large areas totally cleared, depriving local wildlife of valuable cover and nesting areas.

The larger mines in Scandinavia are old and present little current danger to the wilderness, but so long as prospecting continues, there remains a potential threat. This exploitation has many secondary effects, such as the construction of new roads. Roads open up the wilderness to poachers and tourists. Developers follow, to build leisure complexes and other facilities for tourists.

Such construction has led to several conflicts in the past. In the 1970s conservationists fought in vain against a decision to construct a road through Abisko National Park in the far north of Sweden, and other protected areas are still threatened by plans to run roads across some of their very wildest parts.

The very attractiveness of these northern wildernesses causes problems. The growing numbers of tourists are causing increasing damage to the fragile habitats of bogs and wetlands. More and more people build summer homes, which now number hundreds of thousands, especially around more accessible and scenic lake shores. These have transformed the surroundings of reserves, leading to human disturbance of the wildlife.

The Lapland National Parks

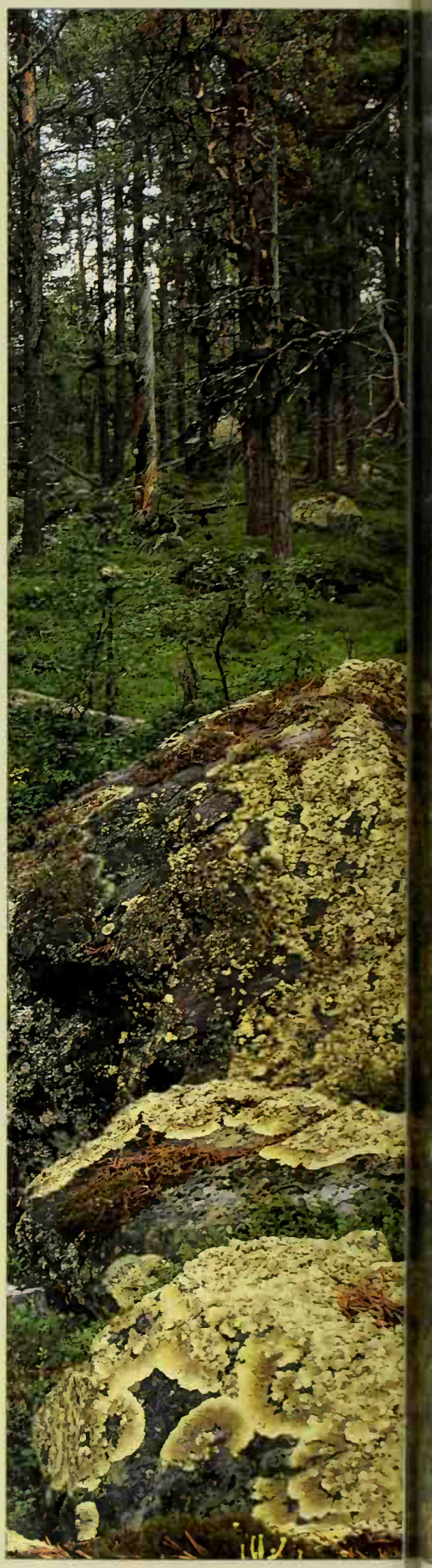
Two of the first national parks declared in Sweden in 1909 were Sarek and Stora Sjöfallet. They share a common border, and in 1963 a further park – Padjelanta – was added. Altogether the three parks cover 523,200 ha (1,292,300 acres) of mountain habitats – the largest area of protected wilderness in Europe.

Sarek National Park has the most alpine landscape of the three, with hundreds of glaciers and sharp peaks (the highest 2,090 m/6,854 ft above sea level), big rivers and deltas; in the east are deep valleys with birch forests that shelter wolverines, brown bears, lynx and moose. Above the birch, dwarf willow scrub gradually gives way to alpine tundra, which in summer is speckled with the large white flowers of the mountain avens. Golden eagles and gyrfalcons hunt the slopes, whooper swans and many different species of duck breed in the wetter areas, and long-tailed skuas nest on the stony tundra. Sarek is a true wilderness. Access is difficult, and there are no marked trails or mountain huts. Even so the park receives about 2,000 visitors a year.

By contrast, there is easy access to Stora Sjöfallet via the road that runs through its center, and about 12,000 visitors find their way here each year. The road was constructed for the hydroelectric power installation that ruined the park's main attraction, an impressive waterfall. A line of lakes above the waterfall became overdammed, and the fall now forms an ugly waterless scar for much of the year. However, the surrounding mountains remain pristine wilderness, fully deserving their national park status. Remnants of primeval forests of Scots pine and Norway spruce are home to bears, lynx, wolverines and moose.

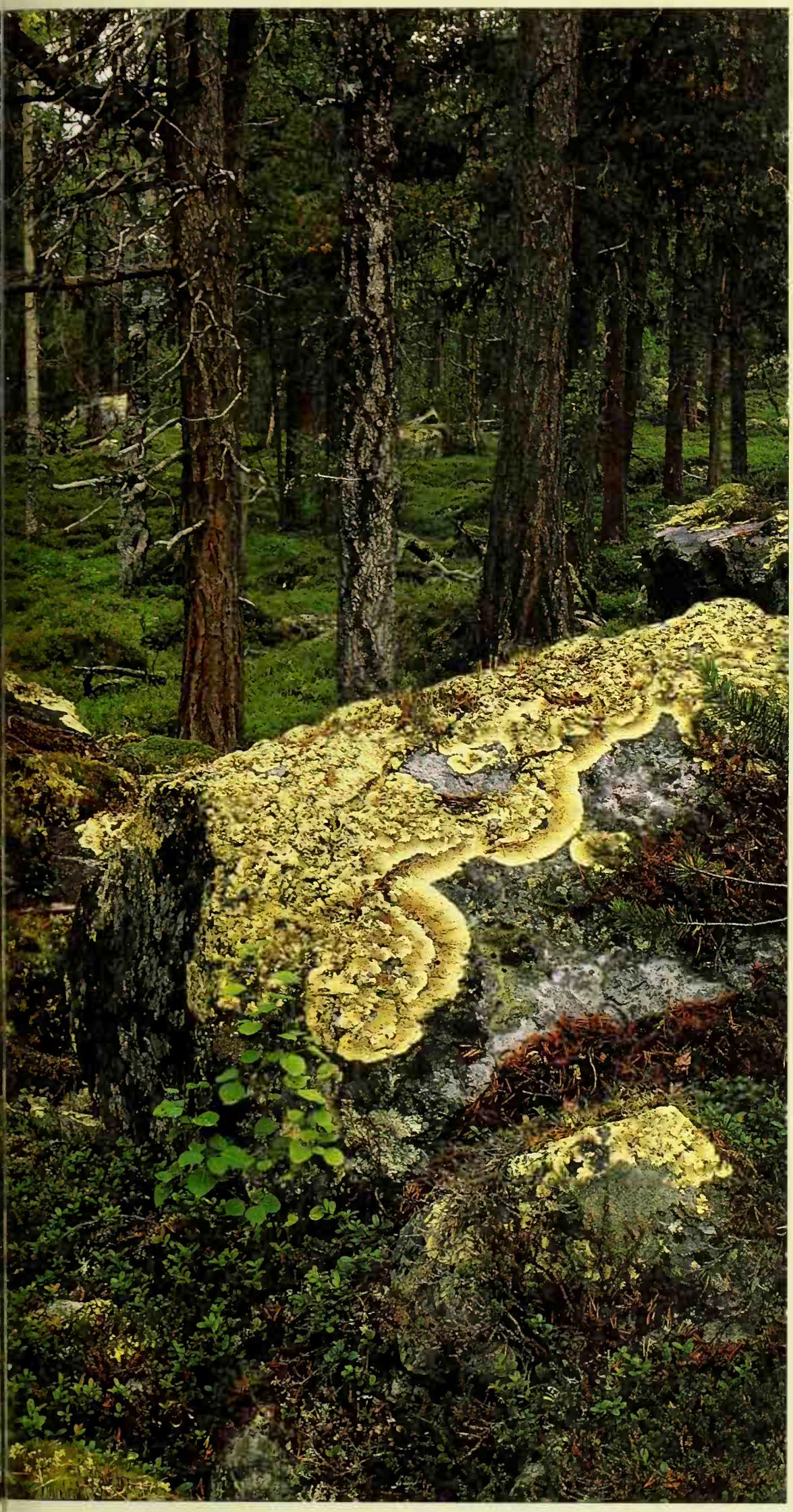
Padjelanta, the largest of the three parks, has a quite different kind of mountain scenery. It is more open, and consists of low, undulating ridges, some high, isolated massifs and large, wide lakes. The area has many rare flowers and a rich birdlife. As in Stora Sjöfallet, there are some marked trails and huts for walkers and crosscountry skiers, who number about 2,000 a year. There is no strong tradition of scientific research and education in the Swedish parks, but in Padjelanta research into plants, animals, geology, glaciology and hydrology has been going on since early this century.

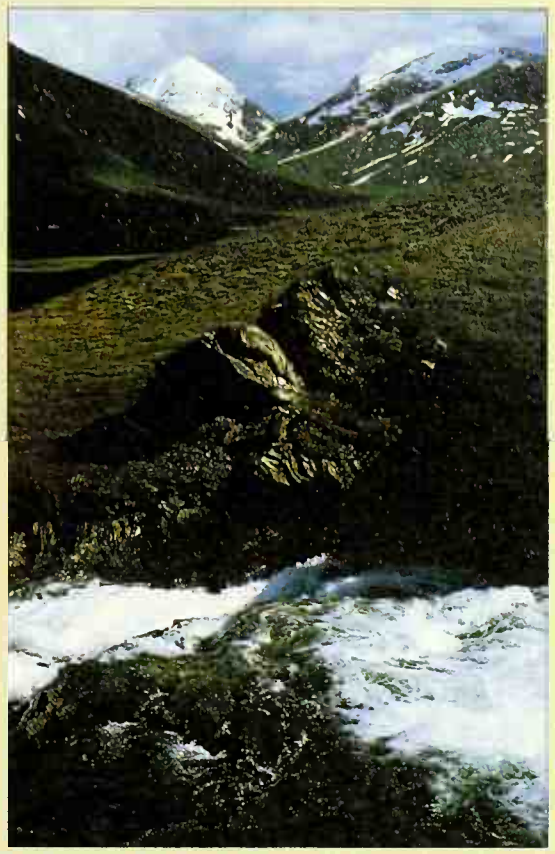
The three parks are managed by a central authority, the National Swedish Environmental Protection Board. This is situated in Stockholm, but has a local office. Because of the remote situation of the parks, few people visit them for much of the year, so there are no serious management problems, except for the politically sensitive issue of the Lapps.



Lichens growing on rocks in Stora Sjöfallet National Park. Lichens flourish in clean air, so they are good indicators of the presence of airborne pollutants. The greatest environmental threat to these Lapaland parks comes from hydroelectric power schemes.

A moose in Sarek National Park Moose take leaves from trees and shrubs and also plants from the forest floor. The species is found through much of northern Europe and Asia as well as North America, evidence of the land route that once existed between them.





Remote Sarek National Park has mountain scenery unrivaled in Sweden. The lower slopes are clad with birch and willow; above lies the open moorland. This fragile wilderness is threatened by tourism and by some of the practices of the Lapps, who wish to herd reindeer here as they have done for centuries.

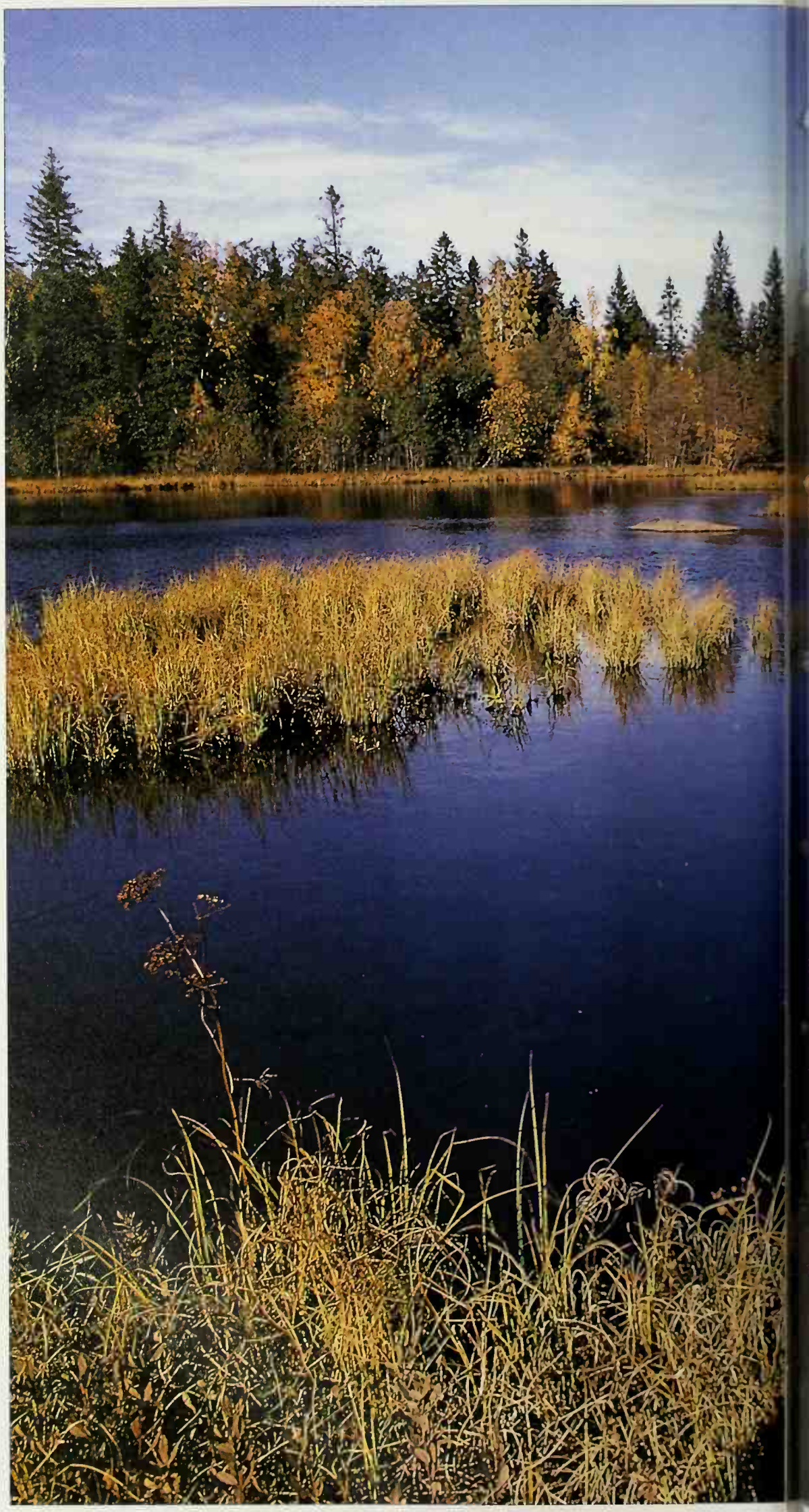
The Lapps have several thousand reindeer in the parks during the summer months, but in winter the reindeer migrate to the forests of the eastern lowland. The Lapps have retained the rights to commercial hunting of ptarmigan and willow grouse. This is questioned by conservationists, who are also worried about their use of motorbikes to round up their animals: the fragile tundra vegetation is easily damaged by vehicles. There are also claims that the Lapps illegally kill predators such as wolverines and eagles, which may threaten their animals. The conflict between the parks and the interests of the Lapps needs to be resolved to safeguard many of Scandinavia's protected mountain areas. The Lapps have farmed their reindeer here for centuries, and feelings can run high.

In the 1970s there were fears of an increase in tourism, especially in one of the most interesting areas, Sarek's Rapa river valley. Fortunately, the number of visitors there has decreased in recent years. However, the problem may recur again in the future, because the fragile environments of these parks can carry only low numbers of tourists.

Lakes of the northern forests

Dotted like jewels in the broad belt of boreal coniferous forest, or taiga, that circles the northern hemisphere are numerous lakes. These may be extensive bodies of water, like the Great Lakes of North America, or deep and ancient, like Lake Baikal in Siberia, which contains one-fifth of the world's fresh water. Others are shallow, formed in depressions in waterlogged ground where meltwater from the winter snows is prevented from draining away by permafrost lying below the surface.

The ecosystems of lakes are highly complex. Planktonic plants and animals, and detritus from lakeside plants, feed a variety of mollusks, shrimps and worms as well as insect larvae. The northern lakes and bogs are breeding places for millions of midges and mosquitoes. All these lifeforms are eaten by different species of fish, which in turn support other animal predators. The reed beds fringing the lakes provide nesting sites for the large populations of water fowl that migrate to these rich, northern feeding grounds in summer.



A reed-filled shallow lake surrounded by coniferous forest in northern Finland

ANIMAL LIFE

SEASHORE, FARMLAND AND FOREST · THE LONG WINTER · PROTECTED OR PERSECUTED?

Thinly populated, with rugged mountains and dense forests, the Nordic countries are a last refuge for rare animals such as the Brown bear and the lynx, which have almost disappeared elsewhere in Europe. The region also supports large numbers of elk (moose) and reindeer, and other animals that had a more southerly distribution before the climate warmed. The Svalbard archipelago, which includes Spitsbergen, is a major denning area for Polar bears. The nutrient-rich waters of the Norwegian Sea support huge breeding colonies of seabirds along the cliffs of Norway, Svalbard, the Faeroe Islands and Iceland. The numbers of some animals are so small, however, that they disappear from the region from time to time – the entire population of wolverines in Finland occasionally crosses into the Soviet Union.

COUNTRIES IN THE REGION

Denmark, Finland, Iceland, Norway, Sweden

ENDEMISM AND DIVERSITY

Diversity Very low to low
Endemism Very low

SPECIES

	Total	Threatened	Extinct†
Mammals	69	10	0
Birds	300*	4	1
Others	unknown	22	0

† *species extinct since 1600 - Great auk* (Alca impennis)
* *breeding and regular non-breeding species*

NOTABLE THREATENED ENDEMIC SPECIES

Mammals none
Birds none
Others none

NOTABLE THREATENED NON-ENDEMIC SPECIES

Mammals Gray wolf *(Canis lupus)*, wolverine *(Gulo gulo)*, Polar bear *(Ursus maritimus)*, Harbor porpoise *(Phocoena phocoena)*, Northern bottlenose whale *(Hyperoodon ampullatus)*, Fin whale *(Balaenoptera physalus)*, Blue whale *(Balaenoptera musculus)*, Bowhead whale *(Balaena mysticetus)*, Humpback whale *(Megaptera novangliae)*, narwhal *(Monodon monoceros)*
Birds Lesser white-fronted goose *(Anser erythropus)*, Red kite *(Milvus migrans)*, White-tailed sea eagle *(Haliaeetus albicilla)*, corncrake *(Crex crex)*
Others Hermit beetle *(Osmoderma eremita)*, Tree snail *(Balea perversa)*, Large blue butterfly *(Maculinea arion)*, Noble crayfish *(Astacus astacus)*

DOMESTICATED ANIMALS (originating in region)

reindeer *(Rangifer tarandus)*

SEASHORE, FARMLAND AND FOREST

A wide variety of marine species thrive along Scandinavia's extensive coastline. The waters of the Atlantic continental shelf, influenced by both cold Arctic currents and the warm Gulf Stream, are extremely rich in plankton, fish and shellfish. The number of different large marine species found at Rustaadirka, a marine national park in Norway, rivals that of the Caribbean and includes the Conger eel, the Basking shark and the Killer whale.

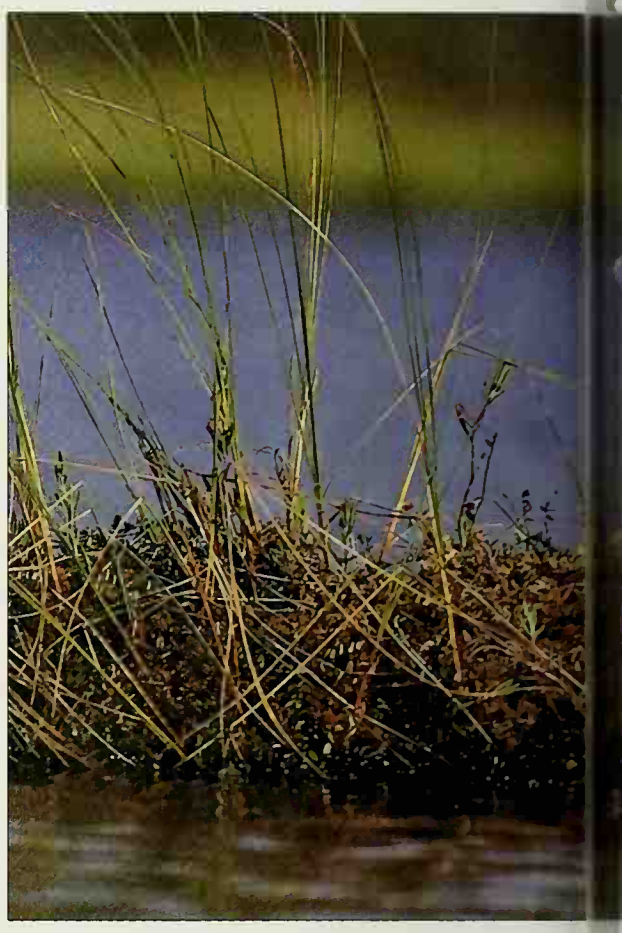
Fjord and seashore

The fjords of Norway's coast, shaped by glaciers and beaten by ocean gales, shelter Common and Gray seals, dolphins and other whales. The cliffs support large colonies of seabirds. On the Lofoten islands in the Norwegian Sea, puffins, guillemots and razorbills live alongside fulmars and kittiwakes. Black guillemots and Storm petrels also breed here, while Arctic skuas nest on the hillsides, preying on the terns and the shorebirds. White-tailed eagles patrol the shore hunting fish, other birds and mammals. A little way inland male and female Red-necked phalaropes "spin" on calm pools as they look for food. Iceland's Lake Mývatn is one of the most important breeding places for wild ducks in northern Europe, with as many as 16 species.

The Baltic seashore is almost completely tideless and is sheltered from the battering ocean storms, though it can be very cold. About 10,000 Ringed seals live in the Gulf of Bothnia and the Gulf of Finland, to the north of the Baltic Sea. However, the population is in decline: the Baltic has become so polluted that many females are unable to breed. The Ringed seal, the smallest of the seals found in Arctic waters, makes breathing holes in the ice as the sea freezes over during the winter. Denmark's lagoons and beaches afford shelter for Common seals, which are similarly threatened by pollution from the North Sea.

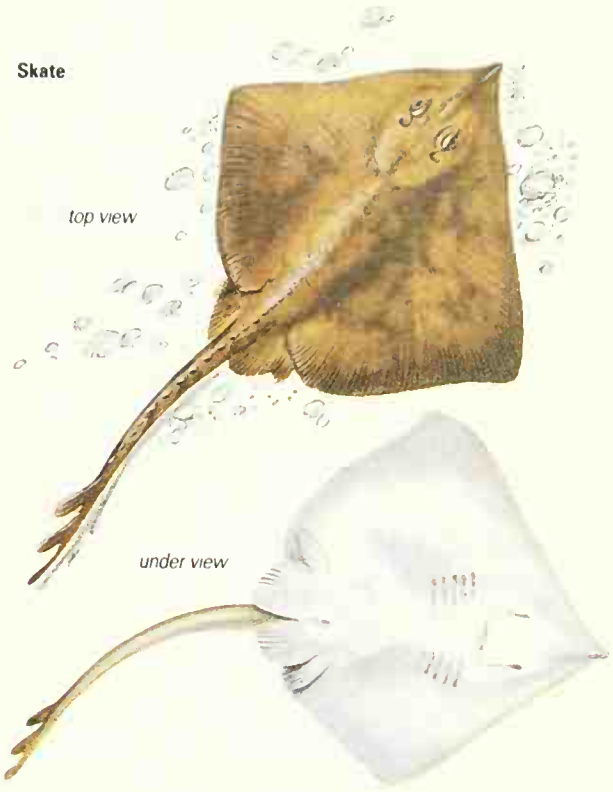
Animals of north and south

In the far north Polar bears from the Svalbard islands, including Spitsbergen, some 800 km (500 mi) north of Norway, may sometimes drift into Scandinavian waters, traveling on ice floes. In these



waters, the bird life is distinctly Arctic rather than northern European. The White-billed diver and the Great northern diver fly in from Arctic Asia and Iceland or Canada respectively to overwinter at Varangerfjord in the extreme northeast of Norway. Both King eider and Steller's eider can often be seen near the shore. Common eider are so numerous that local people still collect eiderdown from the birds' nests during the spring, as do Icelanders. The bird life of the tundra and mountains of Iceland, Norway and the northern parts of Sweden and Finland includes breeding shorebirds and geese. During the Arctic summer the gyrfalcon and the bluethroat – the "nightingale of the north" – can also be seen.

Far to the south, in the gentler climate of Denmark and southern Sweden, typically European animals such as the hedgehog, mole and badger live on the northern edge of their natural range. The rabbit is also able to survive here. Rolling farmland is interspersed with patches of mixed woodland, to the advantage of 12 species of bat; but these mammals only survive in the Nordic countries in places where the climate is favorable. Bats such as Bechstein's bat, Natterer's bat and the Noctule bat are particularly sensitive to the cold. Farther north they are replaced



Inhabitant of the sea bed (*above*) The Common skate viewed from above and below. Skates are bottom feeders, preying on mollusks, crustaceans and fish, and they also scavenge carcasses. Both the mouth and gill slits are on its undersurface.

The cry of the north (*above*) The evocative call of the Red-throated diver or loon is characteristic of northern waters. In summer the bird moves from the sea to inland lakes and tundra pools to breed. Its dense plumage aids both insulation and buoyancy.

Bird of the cliff tops (*right*) In the Nordic region the puffin nests in crevices in the rocks. Its colorful bill serves as a weapon and an advertisement to prospective mates; it changes to a duller brown outside the breeding season.

by the Northern bat, a cold-tolerant species that is found inside the Arctic Circle.

The dark Nordic forests of spruce and pine support the European red squirrel and, in northern Finland, the Flying squirrel. Woodpeckers and redstarts feed and nest among the trees, while capercaillies and Hazel grouse patrol the forest floor. Many owls hunt here: the Little, Tawny and Barn owls are restricted to the south, but the Eagle, Hawk, Pygmy, Long-eared and Tengmalm's owls thrive in colder conditions. On bare mountaintops and on the Arctic tundra the magnificent Snowy owl reigns supreme.

The wolverine and the Gray wolf have suffered badly from overhunting, but the Brown bear can still be found in remote forested areas of Finland, Norway and Sweden, where it is protected. Conservation action has also helped a small population of lynx to stabilize.

THE LONG WINTER

Few animals can survive the harsh climate of the far north, with its long, bitterly cold winters of almost continuous night, without special adaptations. They need extra calories during the winter in order to keep warm, at a time when there is very little food to be found. Most either hibernate, building up a store of fat when food is freely available, or they migrate to warmer climates.

Musk ox
Ovibos moschatus

Migrant birds

An effective adaptation is the ability to leave before conditions become too harsh. Having used the long Arctic summer days to feed and raise their young, most birds migrate away from the colder weather. Some species, such as the Great northern diver, move just a little farther south to find unfrozen sea inlets. Others make long journeys, perhaps as far as southern Africa, to wintering grounds that suit their needs. The long distance record is probably held by the Arctic tern, which covers more than 17,000 km (11,000 mi) to reach its alternative residence in the Antarctic; in this way it passes its life enjoying a continual summer, scarcely experiencing long dark nights.

Migration enables birds to exploit the seasonal resources to the full. The Arctic provides abundant food in the summer, as millions of insects breed in meltwater pools. At the same time, the departure of migrants from the warmer south ensures that resident birds are left with a plentiful supply of food to raise their young.

Birds have migrated for many millions of years, their routes and destinations influenced by the drifting of continents and the effect of ice ages on the landscape. Their knowledge is in part genetic, formed by the trial and error of billions of journeys. The migration patterns of different species vary considerably. Willow and Arctic warblers, for example, both undertake long migrations from the region – the Willow warbler migrates to Africa, while the Arctic warbler overwinters in Southeast Asia.

So great is the passage of bird migrants that Falsterbo, on the southern coast of Sweden, has become an important place for birdwatchers. Each year they come to see millions of birds – geese and ducks, birds of prey, storks and cranes, as well as countless small songbirds – streaming in across the narrow waters of Öresund. Although it might seem that migration is the perfect answer to the severe rigors of winter, it is in fact a very dangerous business. Some birds depart carrying up to 50 percent of their body weight in fat – the fuel for their journey. However, if they are diverted by bad weather, or perhaps run out of energy over water, hundreds or even thousands of individual birds can perish.

Winter survival

During the last ice age the musk ox was driven south by the dramatic change in climate and there is now only a small reintroduced population in Norway. Elk and Musk ox build up reserves of fat for the winter, with a thick coat of highly insulating fur covering the extra flesh. The Musk ox has a particularly long coat that grows luxuriantly to more than 60 cm (2 ft) on the neck. It also has extremely fine underfur.

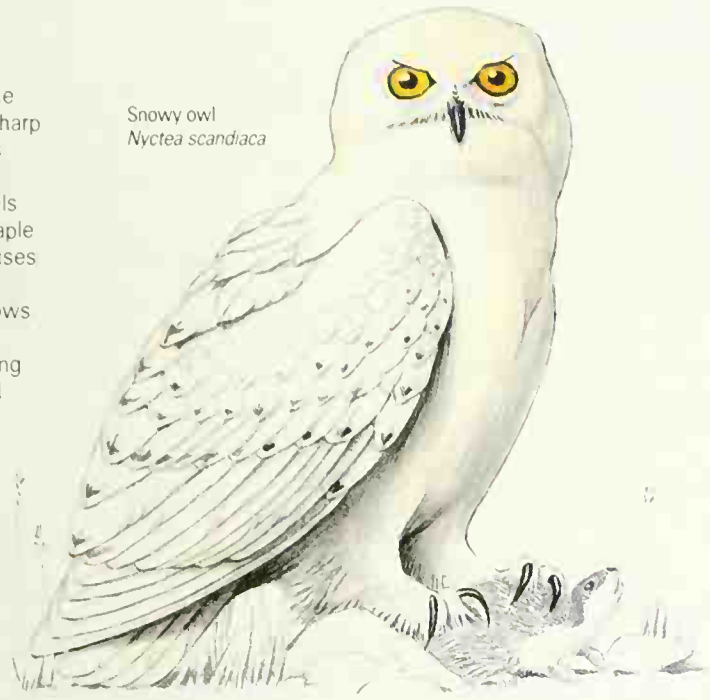
Mobility can mean the difference between life and death in winter. Ptarmigan grow extra feathers on their feet, which act like snowshoes. The reindeer is similarly adapted to the snow; its hooves are broad with the toes splayed far apart, enabling it to cross snow-covered ground. This adaptation is also useful when the tundra thaws in summer; the water forms marshes and swampy areas, and the reindeer's broad feet prevent it sinking. Wolves and wolverines can run across the snow's crust, driving heavy prey such as elk into snowdrifts, where they quickly become exhausted.

The Northern birch mouse survives in the Arctic by hibernating from October through May or even June. Even in summer it spends cold days so deeply asleep in its nest that, if uncovered and picked up by a warm human hand, it will take some time to wake up. Using the techniques of hibernation to conserve energy for those rare Arctic days of sunshine, the Birch mouse reduces to the minimum its need to forage for food.

Snow has extremely effective insulating properties. Voles and lemmings can survive and even raise young in nests and tunnels under the snow, protected from the cold by a layer of air between the snow and the ground, and out of sight of predators. At night it may be −30°C (−22°F) at the surface, but under a snow blanket the temperature remains constant at around freezing point, and there is a plentiful supply of fresh roots and buds for small mammals to eat.

Arctic animals tend to have shorter ears, noses and tails than their relatives in warmer climates. With the animal's overall surface area thus reduced, less heat is lost from the body. A white coat provides camouflage and highly efficient insulation, as colorless hair is hollow; every fall Willow ptarmigan, Arctic foxes, stoats and weasels molt their brownish coats for white ones.

Animals of taiga and tundra The Musk ox has large hooves with sharp rims for digging in the snow. It is able to survive on very sparse vegetation. The Snowy owl travels vast distances in search of its staple prey: lemmings. The wolverine uses its keen sense of smell to find hibernating rodents in their burrows. The elk (moose) has large split hooves that prevent it from sinking in marshy ground in summer and deep snow in winter.



Snowy owl
Nyctea scandiaca

Wolverine
Gulo gulo

Elk (moose)
Alces alces

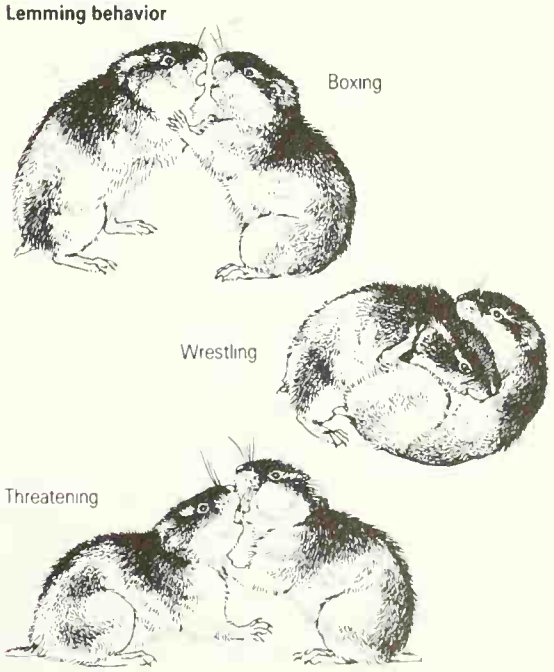
THE LEMMING AND THE SNOWY OWL

Arctic lemming and vole populations fluctuate on roughly three- to four-year cycles, and are synchronized to the activity of the plants on which they feed. In years when the tundra plants fail to flower, they store carbohydrates in their roots. In some winters the roots are extremely nutritious and the lemmings are able to raise large litters under the snow. By the spring the lemming population can be so large that the animals leave in mass migrations to seek food elsewhere – hence the myth of lemming "suicide" runs.

Lemmings and voles form an important food source for many Arctic predators. In years with high rodent numbers, most predators raise extra-large families that will eventually help to reduce the rodent population. However, if the lemming population is low the predators may not breed at all: a female Snowy owl needs "presents" of lemmings from her mate to persuade her even to nest.

Snowy owls make long migrations in the spring to places where lemmings are abundant. The rodent cycles vary from place to place. One year the burrows might be relatively empty in Norway, but crowded in Sweden; but wherever the rodents occur, Snowy owls will also be found.

Lemming behavior



Population pressure When numbers of Norway lemmings increase, so does their aggressive behavior. Here two males wrestle, box and threaten. When the population density becomes too great, lemmings emigrate from their home areas in huge numbers in search of better grazing and more living space.

PROTECTED OR PERSECUTED?

Hillwalking and birdwatching are both popular pursuits in the Nordic countries. Every year in April several hundred birdwatchers gather at Hornborgasjön in Sweden to witness the arrival of the Common crane. These are the first birds to return from the warm south after the winter, and their deep, flutelike calls signal an end to the dark days and bitterly cold nights. The arrival of the cranes is announced on television – an occasion sometimes marked by the giving of small presents to celebrate the days of sunshine to come.

Lapland reindeer

An intimate relationship exists between the people of the north and the reindeer. Nomadic Lapp hunters once trailed the migrating herds of wild European reindeer on which they depended for food. They learned pastoral skills, evolving a culture based on the reindeer, its skin and meat. Those traditions are still practiced in a few conservation areas; but most of Scandinavia's reindeer are now owned by wealthy Lapp farmers, who drive the herds using snowmobiles or helicopters. A few hundred wild reindeer survive in Finland, where attempts are being made to protect some areas of their mixed woodland habitat from being taken over by commercial forestry.

Thousands of reindeer recently had to be slaughtered when radioactive contamination from the 1986 nuclear accident at Chernobyl in the Soviet Union was absorbed by the tundra plants, and hence the reindeer, rendering their meat unfit for consumption. Such contamination may well persist in slow-growing lichens and tundra plants for decades.

Fear of wolves

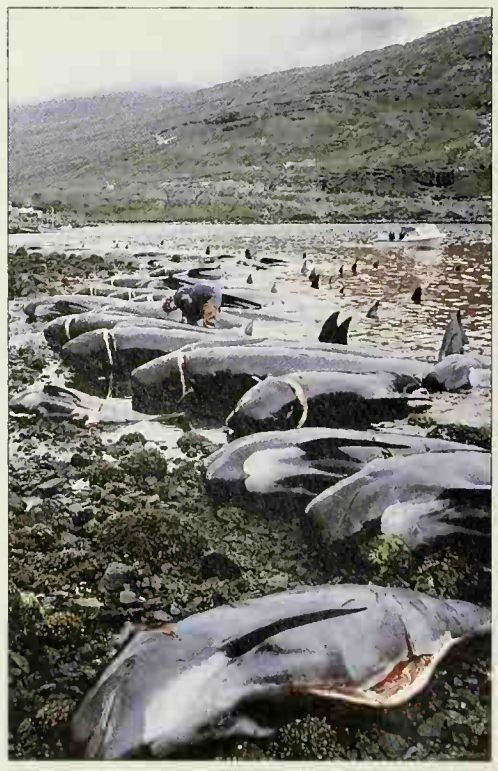
Wolves have been feared and hated by humans for thousands of years. Persecution and habitat destruction have brought them to the brink of extinction in Norway and Sweden, where they are now dependent on human protection for survival. Nobody in Sweden has been attacked by a wolf since 1821, but this does little to reassure farmers and weekenders in the wilderness, who have been brought up on stories of ravening wolves.

In 1983 a pair of wolves met to breed in Värmland, several hundred kilometers south of the Arctic Circle. The attraction to the pair lay in the extensive forests,

PILOT WHALES

Pilot whales have provided the people of the Faeroe Islands – which lie midway between Norway and Iceland – with meat and oil since the islands were first inhabited by the Vikings more than a thousand years ago. Records dating back to 1584 show that a total of 117,456 whales were killed over the next 300 years. Despite worldwide efforts to conserve whale stocks, the hunt continues to this day. When schools of whales are sighted offshore, the islanders take to their boats for the *grindabod*. By shouting, whistling and throwing stones on leather thongs into the water, they confuse the whales with noise (whales have excellent hearing and their calls can be heard over many miles through water). Then they drive them into shallow bays where they are killed with knives and spears.

The people of the Faeroe Islands have little need for the whalemeat. Traditionally it was shared out among the village commune; today it is still second in importance in their diet to lamb and mutton. Many schools of Pilot whales are driven ashore each year, and about 1,500 individuals are killed.



Sea of blood The slaughter of Pilot whales in the Faeroe Islands is a tradition that dates back many hundreds of years.

Nomads of the north (*above*) Reindeer spend the summer on the mountain tundra, feeding mainly on lichen and grass. In fall they migrate long distances southward to the shelter of their native forests. Domesticated reindeer and their herders do likewise. The genetic integrity of the wild forest reindeer is now considered to be at risk from interbreeding with domesticated reindeer.

Heralds of spring (*right*) Common cranes on a field near Hornborgasjön, Sweden, on their way north in spring, take time off to feed and rest. The cranes have flown 5,000 km (3,000 mi) up through Europe to breed among the peaceful lakes and woods of Scandinavia. The potatoes in the surrounding fields are grown specially, and subsidised by the state. This easily accessible food source diverts the cranes from eating seed corn

which contain the highest density of elk found in Sweden. Regrettably, these and other young wolves have since been killed by humans – one was hit by an automobile in Stockholm, while several others were shot in Norway and Sweden. A blaze of publicity caused passions to run high; a society for the destruction of the wolf was formed as wolf hysteria gripped the countries. Since then 15 more wolves have been publicly hunted down, and no punishment has been meted out to the killers. The total wolf population of Norway and Sweden has now been reduced to fewer than 10 animals. Both countries have ratified the Bern Convention on Endangered Species, but it would seem that this cannot, in practice, offer adequate protection to the greatly maligned wolf.

Among the lakes

Many of the numerous lakes and rivers of the Nordic countries are now devoid of fish and other aquatic life. This natural disaster has been caused by clouds containing acid rain, produced mainly by the pollutants emitted by industry and motor vehicles in Britain and on the European mainland, which are blown over the Nordic countries. The rain that falls reacts with chemicals in the soil to acidify water to such an extent that fish are unable to survive in these conditions.

Some aquatic animals, however, have continued to thrive, especially in the far north. In Finland, where human population is low, the country's great many lakes provide an ideal habitat for beavers. The activities of this animal – chopping down trees and building dams and lodges – can flood hundreds of square kilometers of countryside. Beavers were hunted almost to extinction for their fur in the 19th century, though efforts have since been made to preserve and reintroduce the animals. In Norway and Sweden the European beaver was used for the experiment, but in Finland it was found that the Canadian beaver thrived better and the country now has both types of beaver. The experiment has been a great success; by 1980 the population of beavers in Sweden was estimated to have risen to some 40,000. The animals did so well that they succeeded in flooding the large town of Östersund in western Sweden a year or so later. Limited hunting of beavers has even had to be resumed in order to protect the human habitat.

The Atlantic salmon

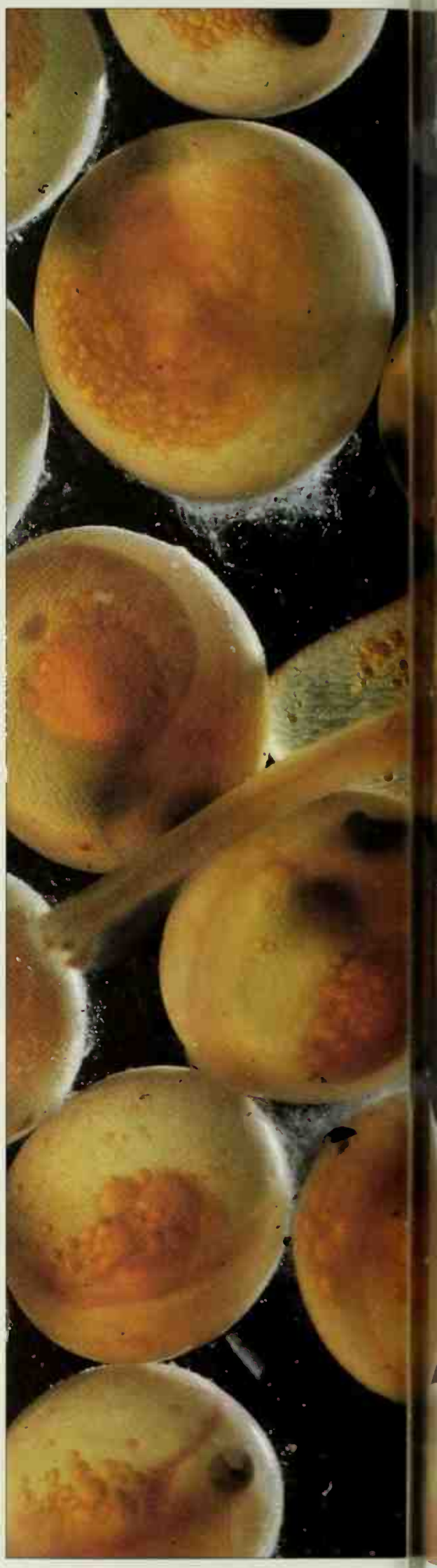
Although it is a sea fish, the Atlantic salmon breeds in fresh water. For millions of years the fjords, rivers and streams of the Nordic countries have attracted vast numbers of salmon. Large individuals swim up the rivers in winter, smaller ones in summer. The marvel of the Atlantic salmon is that, after four years spent at sea, it returns thousands of kilometers to exactly the same stream where it hatched, in order to spawn. The key to how it finds its way is a remarkable sense of smell allied to an acute memory. Rocks, soil, vegetation and the presence of juvenile relatives give each stream its own distinctive flavor. The salmon literally "smell" their way home.

The females select spawning sites in the gravel where they are courted by brightly colored males as they lay their eggs. Acts of spawning continue for a fortnight, the salmon resting in deep holes in the riverbed between each tiring bout; finally they drift back to the sea. Mature salmon do not feed in fresh water, and they are so exhausted by their efforts that most males die before they reach the sea. Females seldom survive four spawnings.

The eggs hatch in April or May, and the young emerge from the gravel to feed on insect larvae and other invertebrates. The young salmon, or "parr", stay in fresh water for one to five years before migrating to the sea (as "smolt"), where they grow rapidly, reaching over 14 kg (30 lb) in just three years.

The salmon fishing industry

Angling is an inefficient way of catching salmon and it inflicts relatively little damage on fish stocks. Even netting the mouth of the estuary allows reasonable numbers of salmon to swim upstream to breed. Unfortunately, in the late 1950s a United States nuclear submarine reported large shoals of salmon under the ice of the Davis Strait, between Baffin Island and Greenland. This sparked off a rush of commercial fishermen to capitalize on the important discovery of where the fish spent their growing period at sea. Disaster followed as the Atlantic salmon population was decimated. Many North Atlantic netsmen lost their livelihood, and anglers their sport, as fewer and



Salmon leaping a waterfall (*below*) The urge to return to their spawning grounds is so strong that salmon can overcome formidable obstacles, aided in this case by their powerful tails. Sadly, such determination is often thwarted by dams and sluices.

fewer salmon returned to spawn in the streams where they were born.

A recent threat to the salmon fishing industry has come from the accumulating effect of acid rain. Sweden is particularly susceptible to its effects because its rocks and soils are already naturally acidic rather than alkaline, so there is little buffering action.

Besides affecting organisms directly, the acids leach heavy metals from the soil. Aluminum that has been unlocked from the soil and leached into streams has a devastating effect on fish and their invertebrate food. In 1900 anglers took 30,000 kg (30 tons) of Atlantic salmon out of the seven main rivers of southern Sweden. Since 1970 nothing has been caught – the water is now too acid to support aquatic life.

The threat from salmon farming

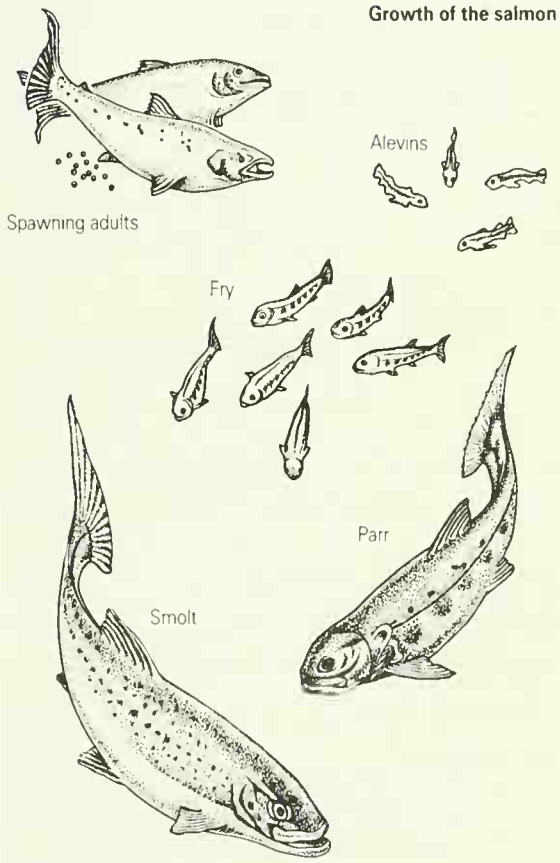
Salmon farming has become a major industry, providing most of the salmon for the domestic markets of Europe. The fish are bred and reared in huge nets that are anchored in saltwater inlets and in sheltered bays. Carefully measured quantities of artificial food are scattered in the water by automatic feeding devices. Inevitably some of this food is swept out of the nets to fall on the seabed.

In the confines of these hatcheries diseases and parasites can spread very rapidly among the young salmon, and chemicals and antibiotics are added to the water in order to control them. These additives also leak into the surrounding water, and affect other marine life such as crustaceans and mollusks.

These farms are also a threat to the wild salmon. Each river has its own distinct genetic stock of salmon, finely adapted by evolution to the particular conditions of that river. Escaped farmed salmon interbreed with the wild ones, reducing the genetic variability of the species and also the ability of the fish to survive in particular rivers.

Hidden in the gravel (*left*) salmon eggs and alevins (newly hatched fry) are nourished by fat yolk sacs. They still have their external gills, but these will disappear as the yolk sac is absorbed

Life cycle of the salmon (*right*) Salmon deposit their eggs at 5–10 minute intervals between extended periods of rest. The eggs are nourished for the first few weeks of life by a yolk sac attached to the abdomen. As soon as its fins are more developed, the salmon fry's downstream journey begins. It develops distinctive markings and becomes known as a parr. In fresh water, salmon grow comparatively slowly. The parr's characteristic markings disappear when the salmon becomes a smolt and enters the sea where it remains for up to four years. As the adult fish return to the rivers of their birth and head upstream for the spawning grounds, the males' color heightens and their bottom jaw develops an upward hook, which impedes the temptation to feed. The rigorous journey and lengthy spawning process – about two weeks – considerably weaken the salmon and many die returning to the sea



PLANT LIFE

EFFECTS OF THE ICE AGE · PLANTS OF THE MOUNTAIN SNOWS · TREES – THE MAIN RESOURCE

In the Nordic countries, as elsewhere, the plant life is governed by changes in climate, topography, soil type and disturbances of the land. Here the greatest influence is still the cold of high latitudes; during the last ice age the entire region was covered by the ice sheet. It has left a legacy in the relative paucity of plant species to be found. In the far north tundra plants and peat bogs predominate, giving way farther south to coniferous forests of pine, spruce and birch in the rugged mountains of Norway and around the lowlying lakes of Finland. In the south the climate is milder, and the fertile plains are intensely cultivated. Far out in the Atlantic Ocean, some 910 km (570 mi) west of Norway, lies the volcanic island of Iceland, grassy, windswept and treeless, and the new island of Surtsey, already being colonized by plants.

COUNTRIES IN THE REGION

Denmark, Finland, Iceland, Norway, Sweden

DIVERSITY

	Number of species	Endemism
Denmark	1,400	1
Finland	1,100	very low
Iceland	470	1
Norway	1,700	1
Sweden	1,700	1

PLANTS IN DANGER

Threatened	Endangered	Extinct
16	10	3

Examples *Braya linearis; Cephalanthera rubra; Gentianella uliginosa, Liparis loeselii; Najas flexilis; Oxytropis deflexa* subsp. *norvegica, Papaver lapponicum; Platanthera obtusata* subsp. *oligantha; Polemonium boreale, Potamogeton rutilus*

USEFUL AND DANGEROUS NATIVE PLANTS

Crop plants *Picea abies* (Norway spruce)
Garden plants *Betula pendula* (silver birch); Papaver nudicaulis; *Saxifraga oppositifolia* (purple saxifrage); *Sorbus aucuparia* (mountain ash); *Trollius europaeus* (globe flower)
Poisonous plants *Aconitum napellus; Taxus baccata* (yew)

BOTANIC GARDENS

Copenhagen University (25,000 taxa); Gothenburg (12,000 taxa); Oslo University (8,000 taxa); Reykjavik (3,000 taxa); Uppsala (10,000 taxa)

Fall colors in a rugged northern landscape Lichens cover the rocks and boulders, and a stunted silver birch tree prepares to drop its leaves for winter. Trees are rare in this harsh evironment, the few plants that are tough enough to survive in the northern tundra zones cling to the ground

EFFECTS OF THE ICE AGE

Much of northern Scandinavia lies beyond the Arctic Circle, where even at low altitudes conditions are extremely harsh. These are also found in the higher altitudes of the mountains that run down the western coast. During the last ice age the polar ice cap extended southward and covered the whole of the region. Many plant species migrated south ahead of the advancing ice, but after the ice had retreated with the onset of warmer climatic conditions some 10,000 years ago some species did not move north again to reoccupy their former areas.

The effects of the ice age are one reason why the northern areas have relatively few species of plants compared with those of the south. The poor quality of the soil, which is often low in minerals and other essential plant nutrients, is another contributory factor. An extreme example of the poor diversity is found on Spitzbergen, the principal island of the Svalbard group north of Norway: it has only 110 recorded species of flowering plants.

In the north the growing season – regulated by sunlight and temperature – may be only 100 days long, compared with 200 days a year in the south of the region. The plants have had to adapt to periods of continuous daylight, still with relatively low temperatures, in summer, and in winter to long stretches of darkness and prolonged severe frost.

In the far north of the region, the undulating plains of Lapland support Arctic tundra; mosses, lichens and grasses are prominent, along with hardy dwarf shrubs such as ling or heather (*Calluna vulgaris*), crowberry (*Empetrum hermaphroditum*), bilberry (*Vaccinium*) and

small cushions of *Diapensia lapponica*. In the southern limit of the tundra belt grow birches (*Betula pubescens* and *B. tortuosa*). Few tree species can survive this far north, though there are some isolated stands of Scots pine (*Pinus sylvestris*) or birch growing amid areas of barren rock and subarctic tundra.

Coniferous forest

Farther south the tundra gives way to coniferous forest known as taiga, which covers much of northern and central Sweden and Finland. Here, Norway spruce (*Picea abies*) and Scots pine predominate. Scots pine grows farther north than Norway spruce and is also found at higher altitudes. The forest forms a mosaic with the extensive wetlands of the region; the bogs, fens and mires are often rich in plant species, particularly sedges and mosses. It also supports a small number of broadleaf trees such as birch, aspen and alder. At the taiga's southern limit these give way to mixed conifer and deciduous forest where spruce and pine mingle with hazel, beech (*Fagus*), mountain ash (*Sorbus aucuparia*), willow (*Salix*), ash (*Fraxinus*) oak and even the small-leaved lime, usually found in more temperate areas.

Farther south still there are pure deciduous forests – though many of the beechwoods are in fact plantations. Although the trees themselves are often magnificent, most of the shrubs and herbs are poor and not at all like those of the original wildwood, which was destroyed by early settlers.

In the mountains, as altitude increases, the forests give way to low willow scrub. At the treeline tall herbs grow, with globe flower (*Trollius europaeus*), wood cranesbill (*Geranium sylvaticum*), northern wolfsbane (*Aconitum septentrionale*) and alpine sowthistle (*Lactuca alpina*) prominent. Of these only globe flower is found much farther up the mountain slopes. Then follows a species-rich moist zone with sedges, cotton-grass and cloudberry (*Rubus chamaemorus*). This gives way to the plants of the open *fjäll*; and close to the summit grows the glacier buttercup (*Ranunuculus glacialis*), often at a greater altitude than any other flowering plant. In the mountains there are many small streams, and attractive herbs such as yellow saxifrage (*Saxifraga aizoides*) – some of whose flowers are actually orange – grow along their margins.

The islands of the north

On the Faeroe Islands, which lie midway between Denmark and Iceland, mosses and sedges grow on wet ground, while heathers and grasses thrive in the relatively dry areas. On Iceland the diversity of species is very poor; in the lowlands the grassland is extensive, while mosses, rushes, sedges and cotton-grass are found in wet areas. Subarctic tundra occurs above 200 m (650 ft), but large areas are so cold or dry, or the soil so lacking in plant nutrients, that nothing can grow.

Floristic provinces

Holarctic Kingdom/Circumboreal Region

Arctic Province Long, cold winter and brief summer; characterized by dwarf willows, small birches, dwarf bilberry and bearberry and the mountain avens.

Atlantic-European Province Climate moderated by warm North Atlantic Drift; characterized by ivy, heather and the primrose *Primula scandinavica*.

Northern European Province Relatively new range of plants so few endemic species. Characteristic trees are conifers, e.g. pines and spruces.

Central European Province Continental European climate; plants of mountains farther south (Alps and Carpathians) found at this northern limit of the province.

Map of floristic provinces The Nordic countries are all included in the Circumboreal Region, the Earth's cool northern temperate zone. Much of the plant life reflects the harsh climate of these northern lands.

PLANTS OF THE MOUNTAIN SNOWS

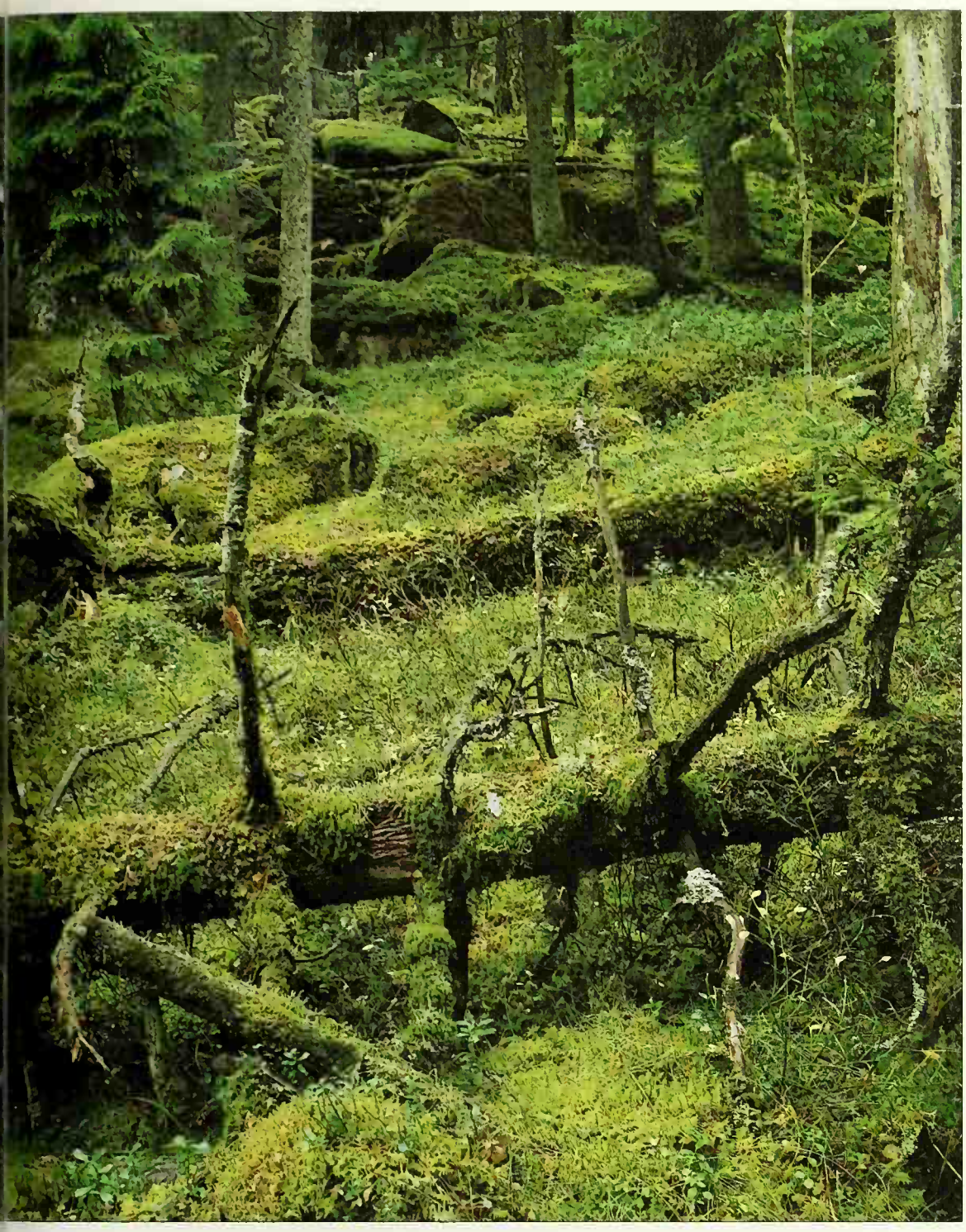
Arctic alpine plants grow at high altitudes and high latitudes, both of which are very cold in winter. The mountain avens (*Dryas octopetala*), for example, is only found high up in the mountains of southern Norway, but will grow almost at sea level in the north of the country. Arctic alpines are well adjusted to snow, which often arrives in the northern mountains in September and lies until the following spring or summer. The icy wind whirls the snow into uneven drifts, from a few centimeters deep to 3 m (10 ft) or more. In sites where the snow has been blown away completely, plants such as trailing azalea (*Loiseleuria procumbens*) are exposed to bitterly cold, drying gusts of wind and are scoured by wind-driven ice crystals that sweep close to the ground. A few meters away, neighboring plants may lie protected beneath a thick, insulating blanket of snow, but even they are vulnerable to grazing by lemmings.

In spring the sun soon melts what little snow and ice remains on plants hardy enough to survive on the exposed ridges, whereas those that are protected by deep snow have to wait several more weeks before the blanket melts and they too can take advantage of the precious sunlight to photosynthesize. The active lives of such plants are telescoped into the few brief weeks of summer, during which time they must grow, flower, fruit and lay down reserves for the following year.

High on the mountains the snow encourages unusual growth forms in isolated conifers. Young spruce trees develop as low cushions that are covered by snow in the winter. The trees reproduce by layering; the long side branches form adventitious roots that penetrate the soil. Upward-growing shoots that survive above the level of the snow develop lateral shoots only on the relatively well protected side of the trunk that faces away from the prevailing wind. In the extreme cold immediately above the winter snowline, the stunted trunks of spruce trees often develop no branches at all.

Pink-flowered trailing azalea (*above*) This prostrate shrub forms a dense evergreen mat, a growth form that not only helps it to survive the rigors of an Arctic winter but also combats the summer drought experienced in a freely draining habitat.

Creeping shrubs of the Arctic (*right*) These lowgrowing plants spread slowly. The bearberry is pollinated by insects, but the dwarf willows are wind pollinated. Male and female catkins grow on different plants, and natural hybrids are common.



A mossy forest The storm gaps of Fiby Urskog are frequently invaded by birches and aspen (*Populus tremula*) before the Norway spruce regains its dominance. The forest is carpeted with many mosses and lichens, which flourish in the moist shelter.

THE PRIMITIVE FOREST OF FIBY URSKOG

In Europe there are very few primitive forests – plant communities that have developed naturally without any human disturbance. The storm gap structure of Fiby Urskog, 16 km (10 mi) west of Uppsala in central Sweden, is one of the earliest examples of a cycle of forest growth to be discovered.

In central Europe the Norway spruce is known to live for 400 years, yet at Fiby Urskog its lifespan seldom seemed to exceed 250 years, and many of the trees were very small. In the 1930s the forest was under threat of being cut down because it was assumed the trees had been felled previously, but they proved to be much older than their height and growth suggested. Tree ring samples taken from as near the ground as possible showed that the ages recorded were considerably greater than those noted at the conventional sampling height of 1.3 m (4.3 ft). This stunted growth occurred because the spruce trees growing in the shelter of large mature trees developed as dwarf trees; they grew well-formed lateral branches but very poor leading shoots. These dwarf trees, which may take as long as 40 years to grow to a height of 1.3 m (4.3 ft), can survive for many years. Mature trees seldom reach old age as they are often felled in groups by the wind on the unstable soils. Dwarf trees then take the opportunity to grow rapidly through the resulting gaps in the canopy.

Indicator plants

Above the treeline there is less drifting, and the snow cover is more uniform in depth. On the bare, exposed ridges the sparse plant life is often dominated by dry lichens that form low, dense piles interspersed with grasses and isolated, stunted, cold- and drought-resistant shrubs. The most favorable position for plants is on the flanks of the ridges, just a meter or two beneath the summit. Here the plants lie midway between an upper zone that lacks protection from the cruel winds of the summit, and a lower zone where snow lie is prolonged. In the lower alpine belt this zone is often occupied by juniper or dwarf birch, with bilberry taking over at higher altitudes.

Lichens are excellent indicators of the environmental conditions in the mountains. *Haematomma ventosum* is known as the wind lichen because it grows in exposed, windswept places in the alpine belt, as does the three-leaved rush (*Juncus trifidus*). *Parmelia olivacea* grows on birches in positions that mark the general level of the winter snowline. Lichens can survive without water for long periods, but they dislike snow cover.

Liverworts, in contrast, are found beneath snow beds that melt for such a brief period each summer (and sometimes not at all) that even the most specialized annual flowering plants cannot complete their growing cycle. Carpets of tiny, dark liverworts, interspersed with mosses, absorb what little radiation there is, even from beneath the snow. They are well suited to this strange environment, where they lack competition and receive a plentiful supply of water. Independent of insect pollination, they begin to produce spores as soon as the snow melts, and simply suspend activity when the next snow falls.

Plants of the snow beds

The plants of the late-melting snow beds, such as mountain sorrel (*Oxyria digyna*), starry saxifrage (*Saxifraga stellaris*) and pygmy buttercup (*Ranunculus pygmaeus*), have very short summer lives and must spring into growth as soon as the snow melts. Some of these specialists have next year's leaves already present in tiny buds concealed in the axils of the leaves. Some snowbed plants are almost full size as soon as they unfold their leaves; others first produce flowers on stalks only a few centimeters above the ground, with the main leaves following later.

TREES – THE MAIN RESOURCE

Left to nature, most of the region would consist of mountain, lake or forest. Even today more than half of Sweden is covered with trees. Although the forests of Sweden and Finland are extensive, they have been greatly altered by foresters. Large areas now consist of conifer plantations managed by the method of clear-felling, sometimes with burning of the woody waste to assist in recycling precious nutrients before new trees are planted. Forests are one of the principal resources of both these countries, whose skills in forestry and technological ability in timber processing and paper manufacture are renowned.

Although the forested areas are large, the rotation times of plantations in the far north are very long; Scots pine takes 130 years to reach maturity in the lowland forests near the Arctic Circle, and much longer in the mountain forests. Grazing by herbivores, such as elk and other deer, also causes regeneration problems. In Norway and Denmark forestry is a relatively minor industry: when the original wildwood of Denmark was cleared, it was replaced by heathland.

Iceland has not always been so nearly treeless. Ten million years ago, when the climate was much like that of present-day Florida in the United States, it supported forests of giant conifers. Even 5,000 years ago it had extensive forests, and when the first permanent settlers arrived in 874 AD there were still large stands of birch and mountain ash the meadows. Almost all these woods have been destroyed by felling and sheep grazing.

Change and conservation

In the north of the region farming is in decline, though until well into the 20th century local farmers made every effort to use all the grazing land available. In Norway particularly, cattle were taken up into the mountains for summer grazing, and hay was gathered from tiny fields. Many meadows in central and northern Sweden have now been abandoned and are gradually reverting to woodland.

Forestry in Sweden is regulated by law, and conservation interests have to be taken into account when groups of trees are felled or clearings replanted. Trees in which endangered birds nest must be left standing. Old deciduous trees such as

JOURNEY THROUGH LAPLAND

Carl Linnaeus (1707–78) is perhaps the world's most famous botanist. He devised the dual name (binomial) system used to provide scientific names for plants and animals. In 1732 the Swedish Royal Society of Science financed Linnaeus on a journey to the north so that he could make the first scientific survey of the plants, animals and geology of Lapland. North of Gävle on the central east coast of Sweden, he came upon the twinflower. It had already been given a scientific name by another botanist, but was later renamed after Linnaeus himself; it is still known as *Linnaea borealis*.

On his return journey he stopped at Tornio on the northern coast of the Gulf of Bothnia, where he discovered that the deaths of local cattle were caused by the animals eating a highly poisonous water hemlock. His drawings of northern species such as mountain avens, *Cassiope tetragona*, starry saxifrage and Arctic rhododendron (*Rhododendron lapponicum*) still survive, as does his *Flora Lapponicum*, published in Amsterdam in 1737.

In 1988 the Linnean Societies of London and Sweden made a journey to Lapland that covered much of the same ground as Linnaeus. Their plant lists and observations show that most of Lapland's natural communities are still flourishing, despite the pressures of the 20th century.

The twinflower (*left*) *Linnaea borealis*, named after the Swedish botanist Carl Linnaeus, is a woodland plant of the taiga, and the only species in the genus. A dainty shade-lover planted in rock gardens and moist peaty places, it flowers from May to July.

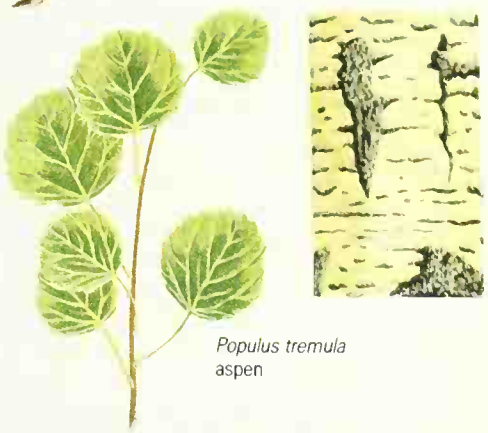
aspen (*Populus tremula*), which are valuable habitats for birds and insects, must also be left untouched, as must zones of slow-growing trees around mires. In southern Sweden it is forbidden to replace deciduous forest with conifers after clearing if the area previously supported 70 percent or more deciduous trees. This law aims to prevent the loss of deciduous trees, which have proved less profitable to grow than conifers. Until the 1980s deciduous trees (particularly birch) growing in conifer plantations were frequently killed by chemicals sprayed from the air, a practice that is now forbidden.

The excessive planting of exotic trees is another cause for concern; the most common species is the North American lodgepole pine (*Pinus contorta*), which is frequently cultivated in the north, but not permitted in southern Sweden. Recent infestations of this tree have shown the dangers inherent in huge monocultures of exotic species.

Forests of the treeline

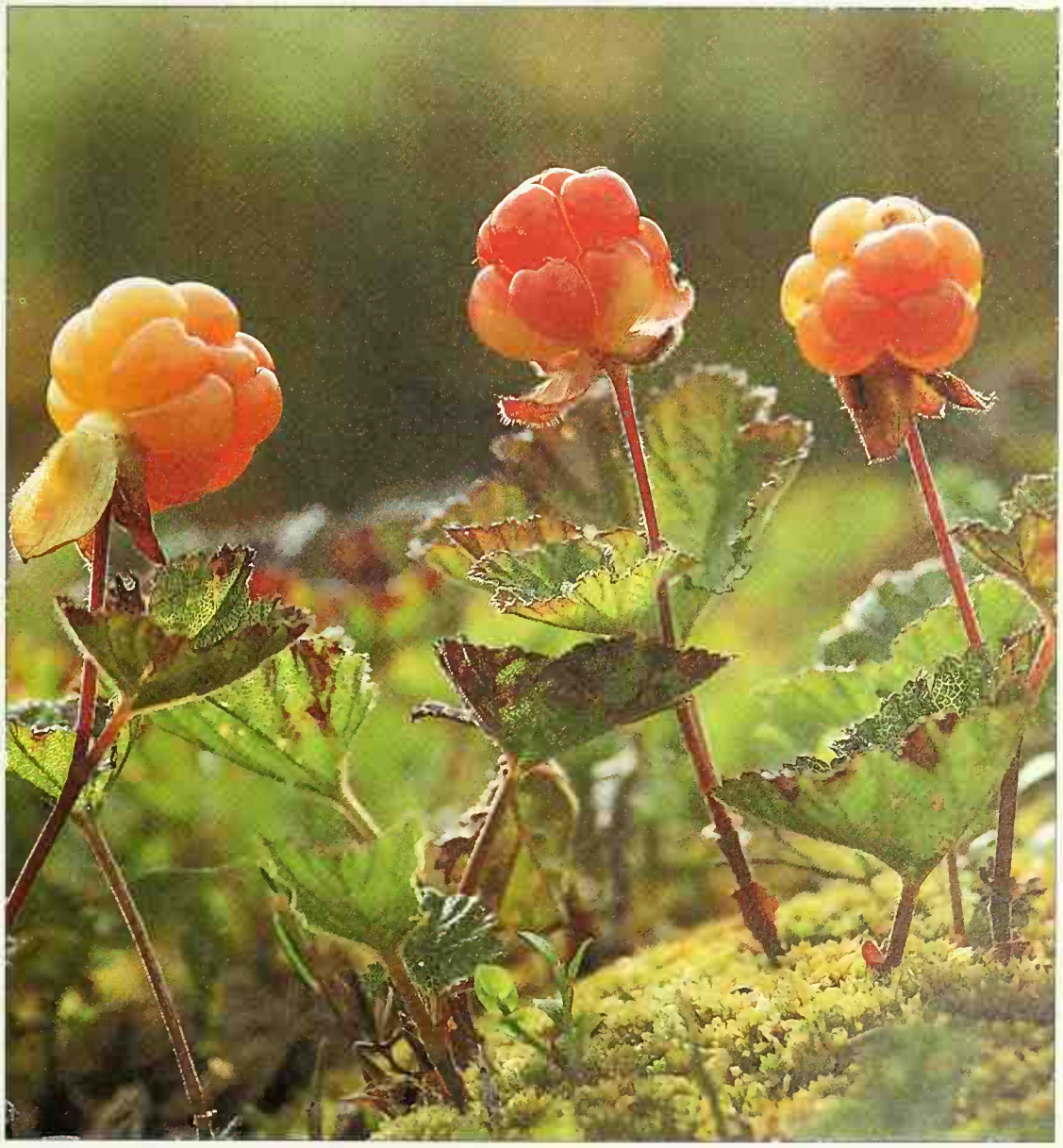
Today the most vigorous debate in forestry concerns the future of the long-established forests close to the treeline. Because the Swedish mountain chain is so long, the area occupied by these trees extends for several hundred kilometers. As it takes over 200 years for a tree to grow to harvestable size here, forestry is of little or no economic value in the long run, and problems with the regeneration of new trees may cause the treeline to drop even lower in some areas. This creates problems for the Lapps, who live in the north, as their reindeer have traditionally grazed the lichens that grow on the trees of this zone when the ground is covered in snow.

Under pressure from conservationists, complex new legislation has been passed to protect the existing forests from excessive felling, though there is still much debate. The Swedish nuclear energy program is being run down, and some alternative source of natural fuel will be required to solve the energy problem. This may eventually result in the establishment of immense, monotonous plantations of willow to supply timber that can be burned in power stations.



Deciduous trees of Nordic lands (*above*) All these trees have fine-grained wood, pale in color, though alder wood darkens on exposure to the air. Birch wood is particularly important in Finland's plywood industry. They are attractive trees, particularly in new spring leaf and fall color.

Translucent cloudberries (*below*) *Rubus chamaemorus* grows in mountain bogs and tundra areas. Solitary white flowers are followed by delicious fruits. These are highly prized by the local people, who collect them to use in desserts and jams.



Surtsey: colonizing a new island

The island of Surtsey emerged in 1963 as the result of a spectacular series of eruptions from a submerged volcano some 40 km (25 mi) south of Iceland. By 1967 an island with an area of almost 3 sq km (1 sq mi) had been formed, some of which has already been eroded. Biologists immediately recognized the unique value of Surtsey as a natural laboratory for the study of succession – the way in which an area comes to be colonized by a series of plant and animal species that continue to interact and develop until a relatively stable community has evolved.

The development of plant life on Surtsey has been fairly slow, hampered by severe winters with low temperatures, high winds and scouring sand, while waves often sweep coastal plants away. Seeds and plant fragments frequently arrived by sea, swept from islands such as Geirfuglasker (5 km/3 mi away) or the larger Heimaey, one of the Vestmanna Islands (20 km/12 mi away). The spores of mosses and ferns were carried in on the wind, and snow buntings visiting the island deposited seeds there.

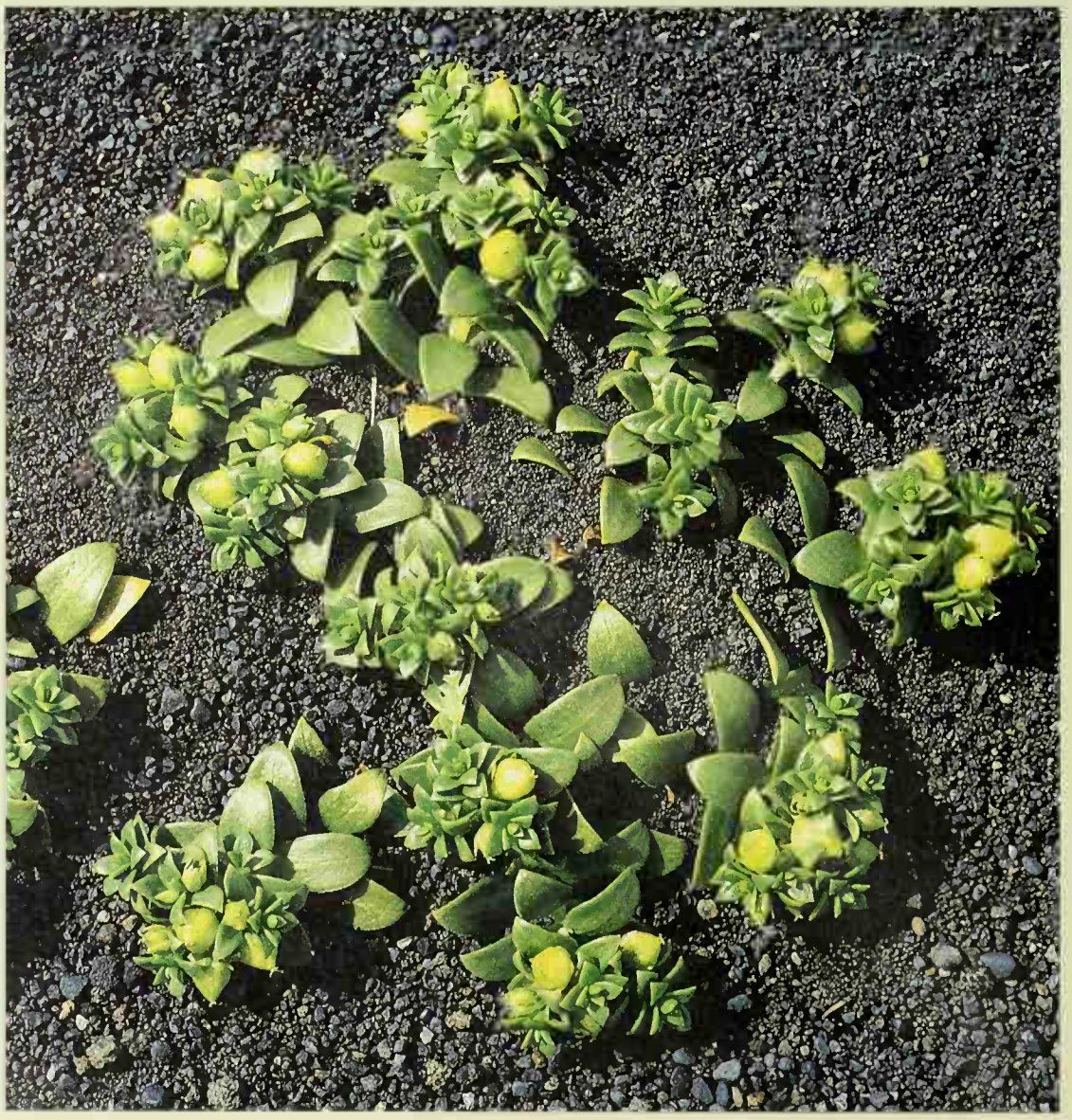
In the first few years colonization was so slow that regular counts could be made of the individual flowering plants. In 1965 all 30 small plants recorded were species of annual sea rocket (*Cakile maritima*); none flowered, and all of them were later killed by volcanic ash.

The early stages of succession

Virgin land is usually first colonized by the lower plants (algae, lichens, mosses and ferns). Surtsey is unusual because the flowering plants were the first to become established. In the early years the number of flowering plants fluctuated considerably, with a sudden jump from a total of 199 in 1972 to 1,273 in 1973. The latter included 33 sea rocket plants and 586 plants of common scurvy grass (*Cochlearia officinalis*). There were 66 plants of lyme grass (*Leymus arenarius*), which is important in the formation of coastal dunes, and just one of red fescue grass (*Festuca rubra*), which is able to grow on both dunes and cliffs. Sea sandwort (*Honkenya peploides*, 548 plants), with its extensive underground rhizomes, was doing well, and there was just one chickweed plant (*Stellaria media*). The young dunes attracted nesting seabirds that enriched the developing soil with their feces.

Although mosses arrived later than the mainly coastal flowering plants, by 1969 they had colonized lava surfaces in the interior of the island. By 1972, 85 species were recorded, often growing in warm sites close to volcanic vents. The first lichens were observed in 1970. The delicate, brittle bladder-fern (*Cystopteris fragilis*) had also arrived.

Plants are now growing well on the sand dunes, and Surtsey has a rudimentary vegetation on its coastal cliffs. There are as yet only a few species of flowering plants. After nearly three decades the plant life is still in an early stage of succession, and competition between species has yet to begin.



Spreading sea sandwort (*left*) This succulent herb is a widespread pioneer plant. It grows on beaches, where it lives on shifting sand and loose shingle.

Mosses growing in the crater (*right*) Normally mosses are among the first plants to colonize a new habitat. It took three years for them to reach Surtsey from Iceland, Heimaey and other small adjacent islands. When they die their remains, together with those of other plants, are changed into humus, which contains valuable plant nutrients and improves the waterholding capacity of the developing soil.

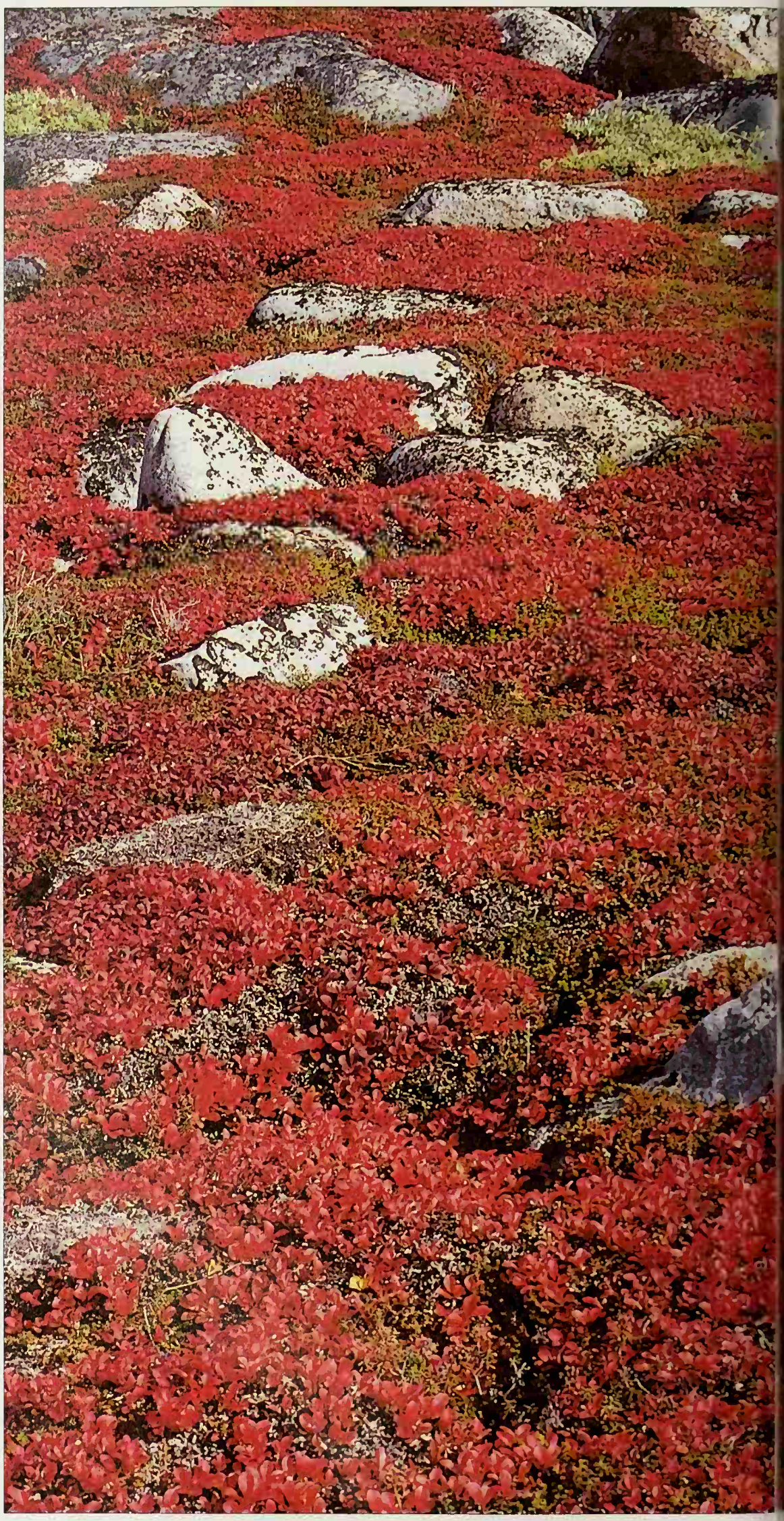
Blue-green oyster plant (*below*) *Mertensia maritima* is a plant of northern seashores. Together with sea sandwort, it was carried by the sea from Heimaey and other small islands to the northwest.

The Arctic bearberry

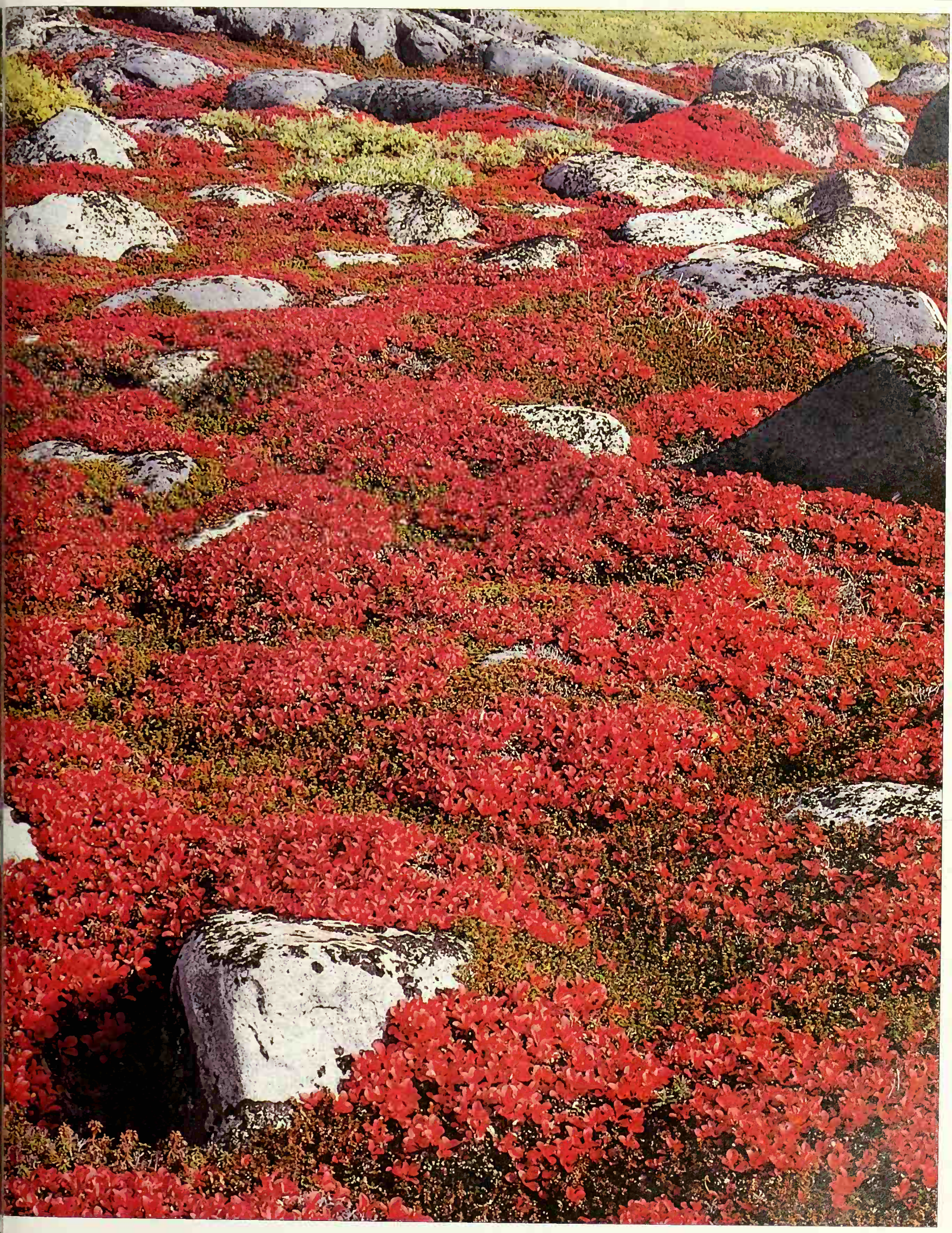
There are two species of *Arctostaphylos* found in the Arctic regions of the northern hemisphere, and both are creeping shrubs. The evergreen bearberry (*A. uva-ursi*) grows on gravelly slopes, rocks or sandy heaths, its flexible branches rooting at intervals. Young branches are often covered with sticky hairs, which probably give some protection in the harsh conditions before the peeling bark of maturity develops. It has pink-tinged flowers in spring and glossy red berries late in summer. The leaves have medicinal value – the plant is cultivated for use in medicines for cystitis and disorders of the urinary tract.

The bearberry's Arctic relative, the deciduous *A. alpina*, is rare in Europe. Its branches are brittle, and carry pure white flowers and black fruits.

These plants of the Arctic, like those of alpine regions, have had to adapt to a variety of difficult conditions, one of which is snow. Although snow insulates, its weight could crush plants unless they are prostrate. Snow water comes with the thaw at a time when the plant is dormant. If the plant is on a slope the water runs off, so for most of their growing season these plants have to cope with drought. In addition, exposed habitats make plants vulnerable to desiccating winds, which further increases their water stress. The small, leathery leaves and low, compact growth form help the plants to survive these conditions.



Fall colors of the alpine bearberry As winter approaches the green chlorophyll in the leathery leaves breaks down, and red pigments (carotins) display their brilliant presence.



AGRICULTURE

FARMING NATIONS · AGRICULTURE BASED ON LIVESTOCK · COOPERATION AND SUPPORT

Agriculture in the Nordic countries is highly efficient and profitable, despite their northerly situation. Denmark, the smallest of the five states, has one of the most successful agricultural systems in the world. Here, and in southern Sweden, there are extensive areas of good agricultural land. There is much less cultivable land in northern Sweden, Finland, Iceland and Norway, but farming is well adapted to the prevailing conditions. Mixed farming predominates throughout the region. Livestock – cattle, pigs, sheep and poultry – are found everywhere; dairy farming is particularly important in Denmark and in southern Sweden. The cool waters of the North Sea and the North Atlantic Ocean are rich fishing grounds; the coniferous woodlands of Finland, Norway and Sweden are also an important natural resource.

COUNTRIES IN THE REGION

Denmark, Finland, Iceland, Norway, Sweden

Land (million hectares)

Total	Agricultural	Arable	Forest/woodland
117 (100%)	12 (10%)	9 (8%)	60 (52%)

Farmers

677,000 employed in agriculture (6% of work force)
13 hectares of arable land per person employed in agriculture

Major crops

Numbers in brackets are percentages of world average yield and total world production

	Area mill ha	Yield 100kg/ha	Production mill tonnes	Change since 1963
Barley	2.2	36.1 (155)	8.1 (4)	+46%
Wheat	0.9	47.5 (204)	4.4 (1)	+129%
Oats	0.9	31.2 (169)	2.8 (7)	−5%
Rapeseed	0.5	18.9 (132)	0.9 (4)	+360%

Major livestock

	Number mill	Production mill tonnes	Change since 1963
Pigs	13.4 (2)	—	+25%
Cattle	6.5 (1)	—	−29%
Milk	—	13.4 (3)	−8%
Fish catch	—	6.0 (6)	—

Food security (cereal exports minus imports)

mill tonnes	% domestic production	% world trade
+2.6	15	1

FARMING NATIONS

The natural environment imposes significant restraints on Nordic agriculture. Snow and ice cover most of Finland and Sweden, as well as much of the tideless Baltic Sea, during the winter. The warming influence of the North Atlantic Drift modifies winters in Denmark, and the coastal areas of Iceland and Norway. The growing season is generally short, and in over a third of the region late frosts – even in summer – pose a threat to farmers.

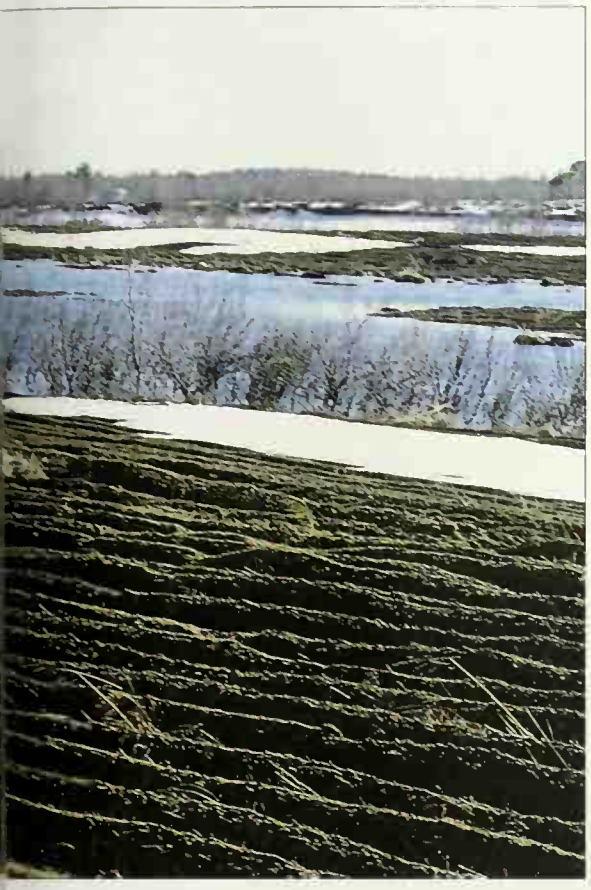
Agricultural activity responds to a pronounced seasonal rhythm of long hours of daylight during the summer and of darkness during the winter. At higher altitudes and latitudes the corresponding climatic extremes make conditions very difficult for agriculture. Iceland's agriculture suffers from a lack of sunshine; western Norway's from a surfeit of rain. Only the brown forest soils of Denmark and southern Sweden can support intensive agriculture; elsewhere soils are often poor, with widespread peatlands. Crop rotation, drainage and fertilization have improved the soil in many areas.

The farming landscape

Bronze Age finds by archaeologists suggest settled farming began in Denmark some 3,000 years ago. Rock paintings show that there were hunting and fishing settlements along the Norwegian coast very much earlier than this. Place-names and other evidence have charted the northward advance of farming up the coasts and into the wooded interiors. The mixed forests that once covered Denmark and southern Sweden were cleared to make way for agriculture; Nordic farming has always been combined with fishing, forestry, hunting and mining.

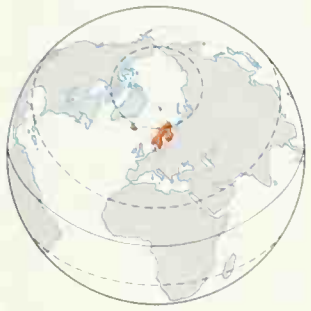
Until the 18th and 19th centuries most cultivated land was generally held in an open-field system. Its reorganization into unitary holdings, which meant that it could be farmed more efficiently, was often accompanied by the breakup of village settlements and the establishment of isolated farmhouses. In Iceland, farms had always been widely separated from each other.

Legacies from the past can be found in the farming landscape throughout the region. Mounds of boulders and stone-built walls, many of them centuries old, bear witness to the backbreaking toil of clearing stones from cultivated fields. In Norway, where timber has traditionally been the principal building material, the log barns and storehouses cluster around farmhouses, each district having its own distinctive style.



Fragile growing season (*above*) The growing season is short, with long hours of daylight. The fields are plowed after the thaw, but frosts can strike even in summer and destroy crops.

Map of agricultural zones In this region of mixed farming the most productive arable land is in lowland Denmark and southern Sweden. Farther north cultivation is limited by the mountainous terrain and the short growing season, and farming is complemented by forestry and fishing.

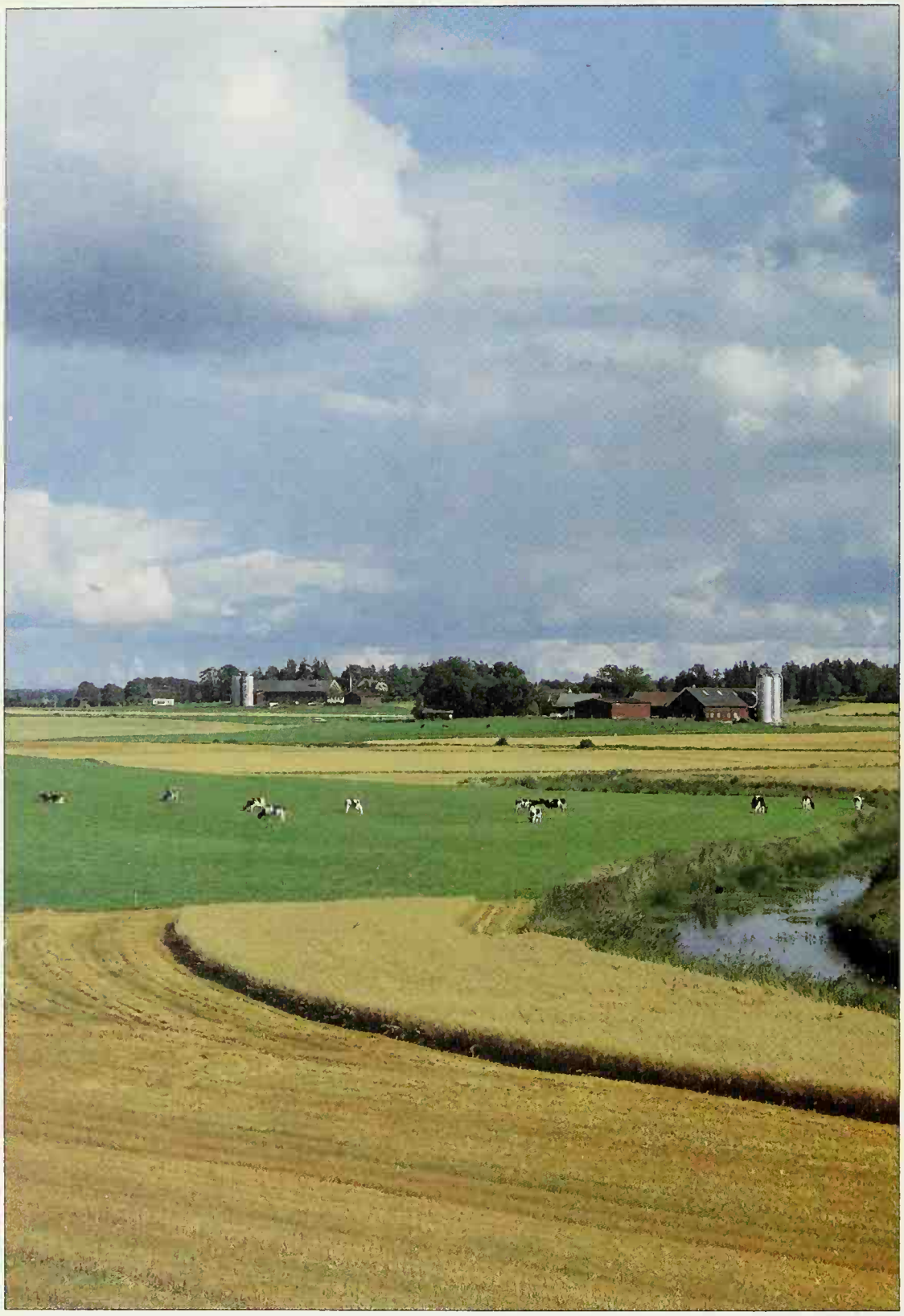


Industrialization came relatively late to the Nordic countries, whose economies were largely agricultural until the early 20th century. A hundred years ago Nordic agriculture was so poor that rural poverty and emigration were common. Today, thanks to plant and animal breeding, investment in new technology, and high standards of quality control, there are overall production surpluses.

Denmark led the way in commercializing its agriculture. Until the 1870s, when the European market began to receive grain from North America, Danish farmers had concentrated on grain production. Unable to compete with the low cost of imports, they changed to dairy farming, with complementary pig and poultry rearing. Denmark had established itself as the principal supplier of bacon, butter and eggs to the breakfast tables of Western Europe by World War I, and is still important as such today.

The increased demand coming from Western Europe's rapidly expanding urban populations also benefited the fishing industry of Scandinavia's Atlantic coast at the start of 20th century. Simultaneous advances in canning and refrigeration techniques meant that it was able to extend its marketing operations. At the same time, Baltic Scandinavia was able to profit from a fall in shipping rates to export increasing quantities of timber, paper and woodpulp to Western Europe.

Most of the region's 23 million inhabitants come from farming, fishing or forest-working backgrounds, and even though they are today mostly employed in service industries, the people still have a remarkable affinity with the land. Farming is a part of Nordic culture, with town dwellers regularly returning to the rural areas, where many of them own second houses. Access to the countryside is unhindered – except in more densely populated Denmark – and the popularity of outdoor recreations brings the farmer and the city dweller into close and frequent contact. So, too, does hunting. Hunters from all walks of life in Norway, Sweden and Finland join in annual culls of hundreds of thousands of moose (elk) to keep numbers under control.



Lush farmland Danish farmers turned to dairying in the 19th century, when their markets for wheat were undercut by cheap North American grain. Cattle and pig farming dominate Denmark's highly successful agriculture – the farms are small but efficient

AGRICULTURE BASED ON LIVESTOCK

In the mixed farming that is characteristic of the region, animal husbandry is the most important element; in Denmark 80 percent of farm revenue comes from livestock. Dairy farming and pig production are often interrelated: the byproducts of dairying – such as skimmed milk – are used to feed the pigs. The number of beef cattle has been slowly increasing over recent years, in response to growing customer demand for meat products. Iceland has very little cultivated land, but there is widespread grazing for sheep, which here and in the Faeroe Islands take precedence over cattle as the principal livestock. Commercial poultry and egg production are most profitable in the southern parts of the region, where fodder crops are easily grown and there is greater access to markets.

Outdoor grazing is possible for only five or six months of the year at the most. During the long winters livestock are kept in the large brick, concrete or timber farm buildings that characterize Nordic farms. In Norway, the cattle were traditionally moved from winter accommodation to high mountain pastures in the summer, but improved fodder production has made this arduous – though picturesque – practice less common. Young cattle and goats are still moved to better upland pastures, and many sheep are transported to them by truck from southwestern Norway. The summer migration of sheep is also still a regular practice in Iceland. Forest grazing has virtually disappeared in Sweden and Finland.

Horses and ponies still play an active part in Nordic agriculture. In Iceland small native ponies are numerous; they are used for mustering sheep. Riding horses are bred for export in Denmark, as well as for domestic agricultural use, and the sturdy native horses of Norway and Finland are still widely used to complement the tractor in winter forestry.

Cultivating the land

Nordic farmers are almost entirely small-scale owner–operators. The arable area of an average holding is less than 30 ha (74 acres); in Norway it is often so small that it is calculated in decares rather than hectares. The size of the farms is not only the result of the system of dividing inherited land; much farmland is also physically fragmented by intrusive bedrock, boulders, lakes and swamps.

Fodder crops, which are essential to the region's livestock-based agriculture, occupy the greatest area of arable land. Only limited areas of land are permanently under grass; longterm leys – where grass is alternated with crops every five years or so – are common. The grass crop is mostly converted to silage, replacing hay, which is liable to rot in wet summers. Ley farming is crucial in northern Scandinavia, where the grass crop takes three-quarters of the field area.

Barley is the chief grain crop, accompanied by wheat in more favored areas. Cultivation of oats and rye has declined, but oilseed rape adds its vivid yellow to the springtime scene in many areas. On the Danish islands and in southern Sweden, fodder beet and, to a lesser extent, sugar beet are common crops.

Potatoes are grown for the farmer's own use as well as for the market. Commercial fruit production is concentrated in the Danish islands and along the margins of the Hardanger and Sogne fjords of western Norway, where apples, cherries and pears thrive, and raspberries are unrivaled in size and flavor.

Iceland's fishing economy (*above*) Fish are Iceland's only abundant food resource, making the country susceptible to market prices and fluctuations in the size of the catches. Agriculture is limited by the rocky terrain and the harsh climate.

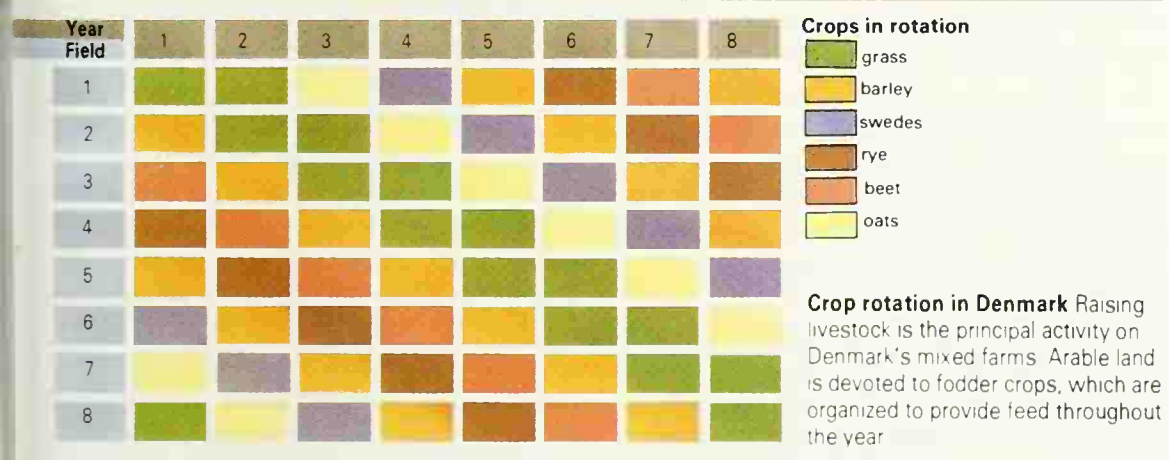
Specialist fruit production (*below*) Raspberries are an important crop in the commercial fruit-growing areas of western Norway and Denmark. Most small farms also grow some fruit and vegetables.

SEA RANCHING IN NORWAY

For a number of reasons, including overfishing, annual catches from the North Atlantic have been declining in recent years. The Norwegian fishing industry has responded to this by turning increasingly to sea ranching – so called because it follows the same principles of stock management as commercial livestock farming: the "ranches" are specially constructed systems of tanks and cages for the intensive breeding of saltwater fish. The first fish to be farmed in this way were salmon and sea trout, and crustaceans such as oysters, lobsters and mussels; more recently sea chard, bass, bream, turbot, halibut and even cod have been added to the stock.

Sea ranches are mostly family run; by 1990 they employed 4,000 people directly, with roughly the same number working in related industries. There are ambitious plans for expansion: target production for 1992 is 150,000 tonnes of fish as opposed to the 95,000 tonnes produced in 1989. Most of the fish are exported in freezer trucks that supply the European market, while 14,000 tonnes of farmed fish are air-freighted annually to the United States.

Sea ranching is a very sophisticated business that requires high levels of scientific research, technical expertise and longterm capital investment. Five experimental stations have been set up to investigate the special problems of sea ranching, such as water pollution, genetic disease and the vulnerability of stock to natural predators. The cages, tanks, walkways and other ranch structures are expensive to install and to maintain; they can easily be damaged by wind, waves, ice or sea traffic. For this reason, landbased saltwater tank systems are also used.



Crop rotation in Denmark Raising livestock is the principal activity on Denmark's mixed farms. Arable land is devoted to fodder crops, which are organized to provide feed throughout the year.

Alternative rural economies

Away from the better agricultural lands of the south, farming is often combined with fishing or forestry. Fish from lakes and rivers provide a modest supplement to farm incomes. Along the Atlantic coast of Norway, where cod and herring are seasonally abundant, fishing and farming have always been closely linked; farming statistics still differentiate between farmer–fishers and fisher–farmers, though the two activities have in fact become more independent in recent years as fishing enterprises have grown in scale. Iceland's economy is highly dependent on fishing: the Icelandic government declared a 320 km (200 mi) exclusion zone around its coast in 1975 to keep foreign fishing fleets from plundering its most valuable resource.

For many smallholders in Sweden, Finland and interior Norway, farming and forestry are inseparable, with timber cropping taking place side by side with crop farming. Both the privately owned timber lots and the commercially owned forests are an important source of employment during the winter months. Softwood timber and timber products are an important source of export revenue; timber is also used extensively for building, fencing and fuel. Forestry is particularly successful in Sweden and Finland. This is explained by good forest management as well as by the relatively rapid growth of the trees.

The timber industry Forestry has been revolutionized over the last few decades. Recognized as a valuable renewable resource, forests are now scientifically managed using a high degree of mechanization. The timber business generates rural employment as well as significant export revenue.

COOPERATION AND SUPPORT

All Nordic farms require high investment of capital. Buildings, necessary to protect livestock against harsh weather conditions, account for the principal outlay. Equipment comes second – mechanical harvesters for grain, seeds and potatoes, tractors and dairying equipment. Underground drainage of arable land is also expensive: in Finland and Iceland open ditches are still common.

Support for farmers is available, through both subsidy and advice. Agricultural cooperatives were established in Denmark in the late 19th century to coordinate the marketing of dairy products. They then spread across the whole region and now include cooperative research and advisory institutions, meat and dairy processing factories, purchasing societies, banks, and mortgage and insurance societies. Management of the cooperatives is mostly in the hands of elected farmers, and collectively they wield considerable political influence.

Financial support is forthcoming from national governments, except in the case of Denmark, which as a member of the European Community (EC) conforms to the Common Agricultural Policy (CAP). The amount of subsidy is determined by the distance of a farm from its sources of supply and principal markets, as well as by the degree of climatic hardship that it experiences. Norway provides the most financial assistance to farmers: in 1988 the average subsidy was $10,000 per farm.

The services provided to rural communities are of a high standard. Roads are generally good, and even in the most remote areas nearly all farms have electricity and telephones. Some local services such as hospitals and cooperative stores have disappeared, but these have usually been replaced with mobile dental and medical clinics, shops and libraries.

Greater efficiency

It is a measure of the efficiency of farming in the Nordic countries that, except in Iceland, there are surpluses of farm products. The situation is more complicated in Denmark, where the imposition of EC milk quotas has caused dairy production to be cut.

At the same time, the increasing world demand for wood products calls for increasingly scientific programs of felling,

maintenance, drainage and fertilization in the woodlands of Finland, Norway and Sweden. Some Swedish farmers have recognized the limited new demand for farm products and are returning land to forest plantation. This move has been encouraged by government policy, as the widely diversified products of the softwood industries account for about 20 percent of the country's exports. The forests provide rural employment, and their management is linked to both nature conservation and recreational facilities.

The modernization of methods of forestry has also brought about many changes. Whereas axes and saws were once the main tools of a mostly seasonal workforce, there are now highly skilled forest workers, using a range of mechanical equipment, who operate throughout the year. Timber is managed as a renewable resource that is grown, harvested and replanted like any other crop.

Greenhouse cultivation Since the 1930s farmers in Iceland have built their greenhouses near hot springs, of which there are many in this young volcanic island. The warm water is used to heat the greenhouses, allowing cultivation of crops such as tomatoes, grapes, vegetables and even bananas.

Finding a balance

Although it is generally profitable and successful, Nordic farming has its problems. For example, the fragmentation of ownership can reduce effective land management. Again, in the marginal agricultural lands of the north, commercial farming – though technically feasible – is uneconomic. In order to survive, many small farmers have to rely heavily on elaborate systems of government subsidy, as well as off-farm incomes. By contrast, because of overproduction, in some areas farmers have been paid to withdraw land from cultivation and to dispose of surplus dairy cattle.

Laws have also been introduced to encourage farm amalgamation, increasing the average farm to a viable size. Since the 1950s Nordic farms have fallen in number, with a corresponding enlargement in their average size. In Denmark there are restrictions on the maximum size of farm holdings to prevent smaller operators from being squeezed out of business by larger competitors.

Given the problem of surplus agricultural production, it should theoretically be possible to supply all essential needs from only the best farmland, without resorting to farming in the high-cost, climatically sensitive areas. The strong agricultural representation in all five national parliaments, which is generally opposed to radical changes in agriculture, often constitutes a problem in its own right. In any case, farming is so much a way of life in the Nordic countries that social arguments in its favor tend to outweigh the logic of economics.

FUR FARMING

Fur farming – breeding animals purely for the value of their pelts – is an important agricultural specialty in Finland, particularly in the north where other agricultural options are limited by the climate. The most commonly bred animals are mink, fox and racoon. Hybrid breeding has increased the size of the animals, and so of the pelts, as well as the range of their natural colors: there are, for example, eight different shades of mink. A quarter of all foxes are bred through artificial insemination. Many of the highly bred animals, especially the "super" foxes that yield an exceptionally large pelt, are very susceptible to disease, making rigorous care necessary.

Feeding is carefully controlled. The animals need twice as much food in the winter as in summer, and their diets of fish, cereals, vegetables and slaughterhouse by-products are seasonally adjusted. Much research has been done on the best methods of caring for the animals in winter, though the cold, dry prolonged winters of the far north naturally produce the finest pelts.

Almost 5,000 fur farms employ more than 25,000 people – many of them women – in what has become a highly professional industry, with its own training establishments, two research stations and a central storage warehouse. Production increased rapidly in the postwar years: by 1990 4 million mink pelts were being produced every year, as opposed to only 70,000 in 1950, and there have been corresponding increases in the production of other types of skins. The development of fur farming has favored the rise of an exclusive trade in the manufacture and sale of fur garments. These are handled by some forty wholesalers, some of whom are direct descendants of the great Russian furriers of the tsarist era. Most fur products are exported, the principal markets being those of Hong Kong, Japan, South Korea, Switzerland and the United States.

The Finnish fur farming industry has been threatened in recent years by international pressure groups opposed to fur farming and the wearing of fur garments. Their campaigns have had a marked influence on public opinion, particularly in Western Europe where fur prices have fallen sharply. Decreasing demand has already taken its toll: after 1986 the number of fur farmers was in decline.

Reindeer herding: the Sami specialty

Reindeer husbandry is the traditional occupation of the Lapps, or Sami people, who live in northern Norway, Sweden and Finland. There are now an estimated three-quarters of a million semidomesticated reindeer in these areas, probably more than at any time in the past. They are managed by only a very small number of Sami – about 2,000 in each of the three countries. This makes Scandinavian reindeer husbandry extremely intensive.

Sami families generally live on smallholdings on the fringe of permanently settled areas, and supplement their incomes with fishing, hunting and craft work. In Norway and Sweden, the Sami have an exclusive right to engage in reindeer husbandry, and receive limited state subsidies. In Finland, Finns as well as Sami who live in reindeer-herding areas may also own reindeer. There are no state subsidies. Reindeer owners, who are taxed according to the estimated size of their herds, are organized into herding associations. Representatives of these associations meet every year at a "reindeer parliament".

The herds, which vary greatly in size, are not nomadic but migrate seasonally along fairly well-defined routes, occupying lower wooded ground in winter and upland grazing land in summer. There has always been freedom of movement across the open frontiers of Finland, Sweden and Norway, though herds tend to remain within the national territories. There is no movement of reindeer from Norway and Finland across into the Soviet Union.

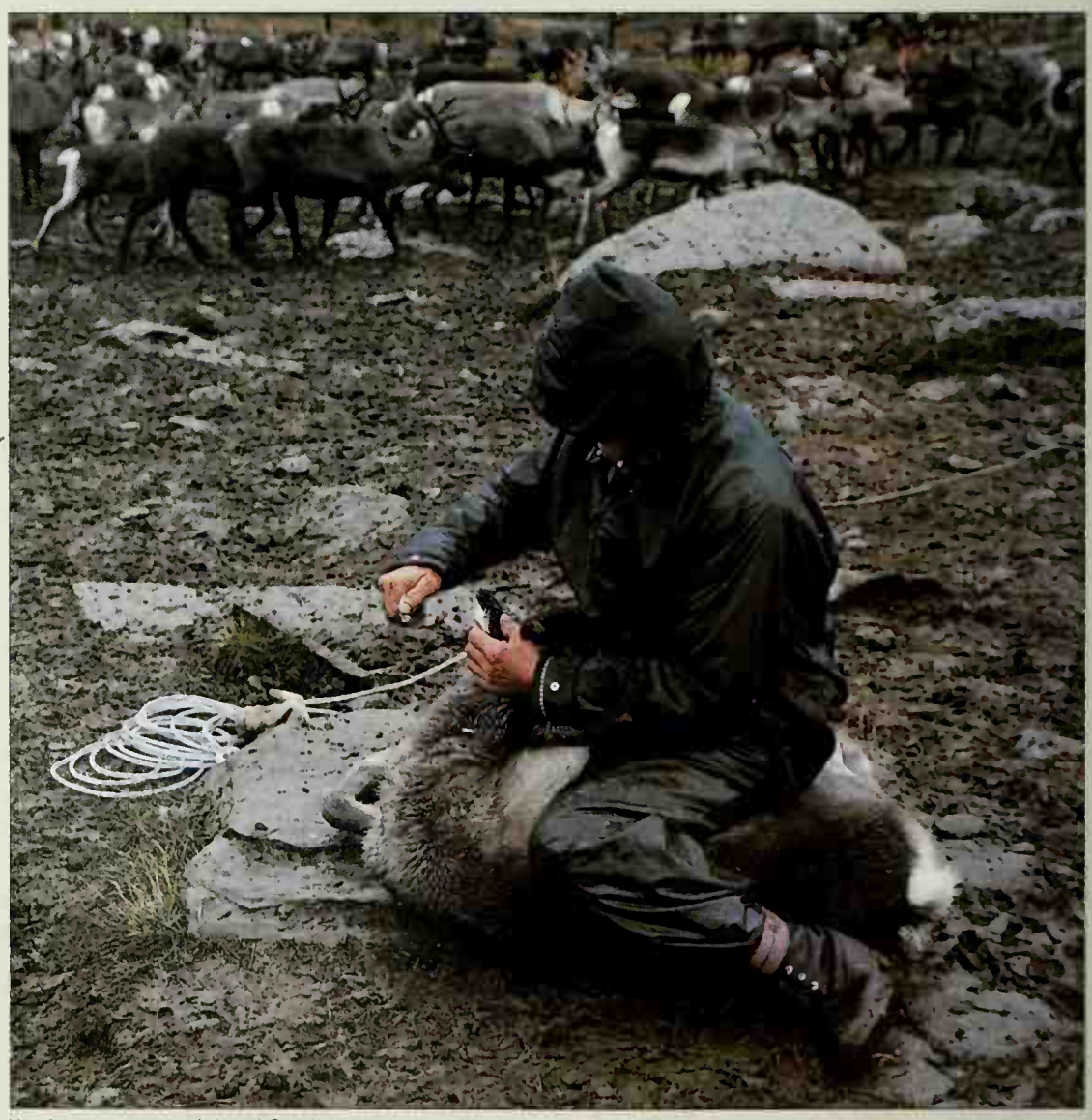
The seasonal rhythm of activity for the herders reaches peaks in late winter, when calving takes place, and in the fall, when the reindeer are rounded up, sorted according to their markings, and selected for culling. About one-quarter to one-third of any herd is culled each year. Meat from the carcasses is then smoked, salted, refrigerated or canned.

It has been calculated that a herd of at least 500 reindeer is necessary to provide its owner with an income equivalent to that of the average industrial worker. If the herd is small, then losses due to predators, traffic accidents and starvation (thousands of which occur every year) can be very costly to its owner. The labor required to tend reindeer is roughly one day per animal per year, so that a herd of 500 reindeer would need 500 days of labor (including extra help required for the roundup). Herding has been brought up to date with the use of snowmobiles and mobile telephones, and particularly large herders even resort to helicopters and light aircraft.

A cause of conflict

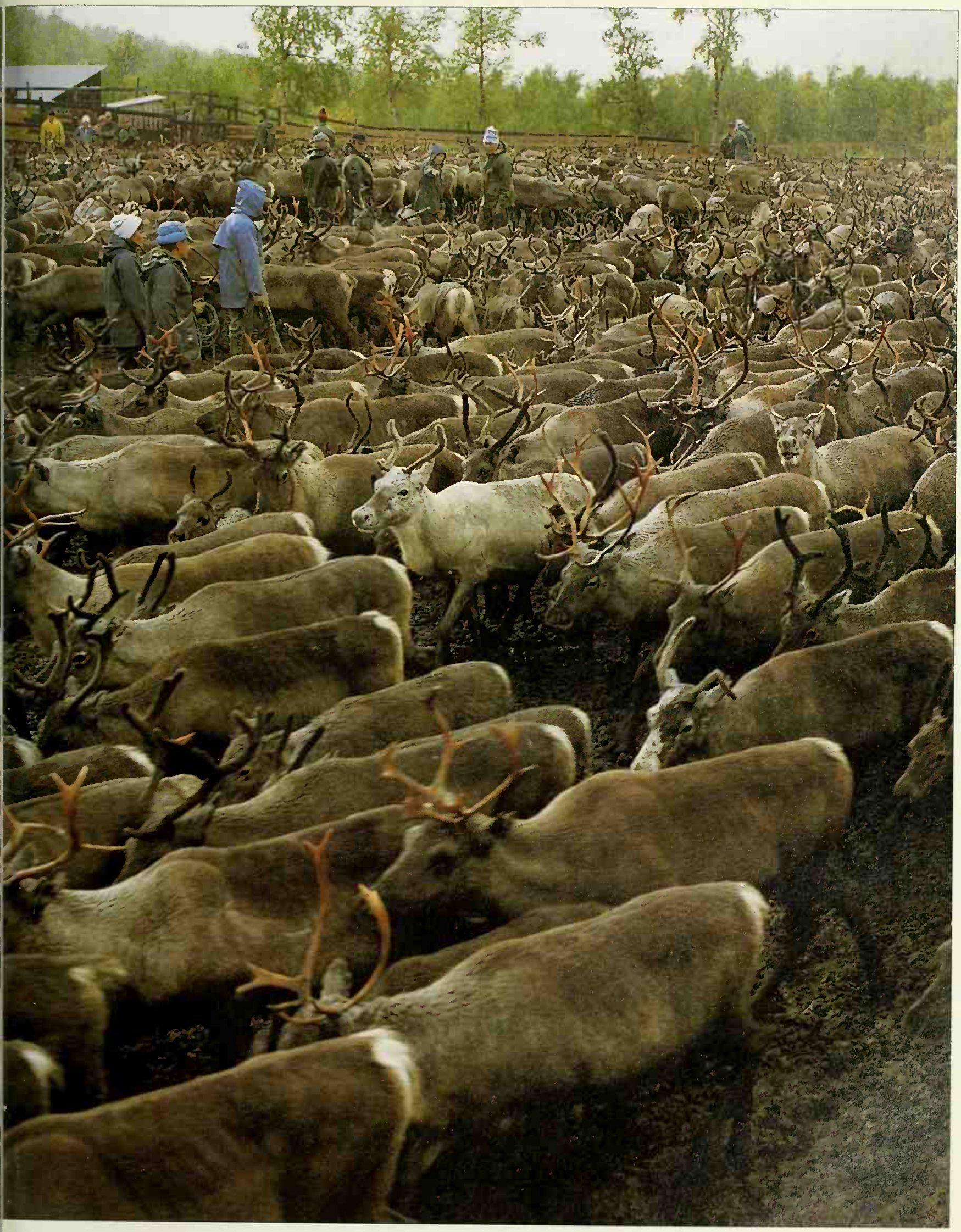
Reindeer husbandry is undoubtedly the most efficient way of using the northern tundra lands, where conditions prohibit most other forms of agriculture – but it causes problems where it impinges on other activities. There is continual conflict between reindeer herders and farmers, foresters, road and rail authorities, and hydroelectricity operators. While reindeer can damage farmland and woods, chemical fertilizers and insecticides can harm reindeer. The construction of highways, railroads and hydroelectric dams may interfere with established grazing rights and migration routes.

The Sami are a vocal ethnic minority who campaign strenuously to preserve their traditional rights. For this reason, reindeer husbandry – the symbol of the Sami way of life – has become a national issue in the three countries, even though it is of only limited economic importance. While some experts consider that the number of reindeer now exceeds the carrying capacity of the grazing lands, the herders point out that modern methods of forestry encourage grass and herb growth at the expense of the lichens that are the reindeer's principal source of winter fodder. In any case, many reindeer die of starvation every year. A totally unforeseen environmental disaster struck in 1986 when fallout from the explosion at the Chernobyl nuclear plant in the Soviet Union contaminated the lichen pastures, necessitating the slaughter of thousands of reindeer.



Herd management (*above*) Sami herders tag their reindeer for identification purposes. The fall is one of the busiest times of the year, when the reindeer are rounded up and corralled. Some of them are culled for meat and leather products.

Reindeer by the thousand (*right*) There are more semidomesticated reindeer in northern Scandinavia than at any time in the past. Some critics believe that the number of reindeer now exceeds the carrying capacity of the grazing lands.



INDUSTRY

A WEALTH OF RESOURCES · AN EMPHASIS ON ENGINEERING · THE DRIVE TO EXPORT

Natural resources – including rich deposits of mineral ores, especially iron, forests, water to supply hydroelectric power, fisheries, fertile land (in Denmark and southern Sweden) for farming and, since the 1970s, oil from the North Sea – form the basis of the Nordic Countries' industry. Today the people of the Nordic Countries produce more than 4.5 percent of the world's exports. Yet their total population is a mere 23 million. The limited nature of domestic demand for manufactured goods led Nordic companies to establish themselves in the international market, and to maintain their position by raising industrial efficiency. Exports now account for 40 percent of the region's total national income, and manufacturers know that their survival is dependent on successful competition in the world market.

COUNTRIES IN THE REGION

Denmark, Finland, Iceland, Norway, Sweden

INDUSTRIAL OUTPUT (US $ billion)

Total	Mining	Manufacturing	Average annual change since 1960
172.1	23.3	95.7	+3.2%

INDUSTRIAL WORKERS (millions)
(figures in brackets are percentages of total labor force)

Total	Mining	Manufacturing	Construction
3.6	0.36 (2.9%)	2.4 (19.8%)	0.82 (6.7%)

MAJOR PRODUCTS (figures in brackets are percentages of world production)

Energy and minerals	Output	Change since 1960
Oil (mill barrels)	589 (2.6%)	N/A
Natural gas (billion cu. meters)	32 (1.7%)	N/A
Iron Ore (mill tonnes)	22.5 (3.9%)	-13.5%
Copper (mill tonnes)	0.3 (3.7%)	No data
Zinc (mill tonnes)	0.4 (6.2%)	No data
Manufactures		
Woodpulp (mill tonnes)	18.9 (15%)	+1%
Newsprint (mill tonnes)	4.4 (13.8%)	+36%
Steel (mill tonnes)	7.4 (1.1%)	+86.8%
Ships (mill gross tonnes)	0.5 (4.5%)	-59.4%
Automobiles (mill)	0.5 (1.1%)	+397%
Telecommunications equipment (US $ billion)	7.5 (8.1%)	No data

N/A means production had not begun in 1960

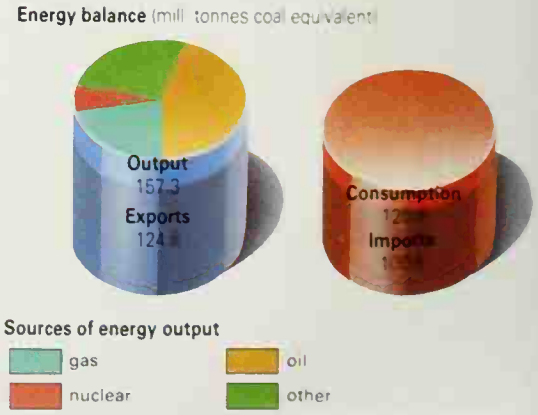
A WEALTH OF RESOURCES

The exploitation of mineral wealth began a long time ago in both Sweden and Norway. Huge deposits of silver, copper and iron are to be found in central Sweden, and metal processing developed around the rich mines in Bergslagen in the 13th century. The first mines to be exploited for the international market were at Sala, where production of silver peaked in the 16th century, and at Falun, which was the largest producer of copper in the world for more than two hundred years, until 1830. Norway's deposits are smaller than Sweden's, but silver and copper were both being mined in Norway in the 17th century.

Sweden's forests provided a ready and cheap supply of charcoal to fuel the blast furnaces used for iron smelting. Only a few regions in Europe were able to match

Red heat (*above*) Metalworking has a long tradition in the region. Sweden's ironworks alone, fueled by charcoal from the abundant forests, produced a third of the world's iron until coal-derived coke replaced charcoal in the mid 19th century.

Energy production and consumption (*below*) Oil accounts for the highest energy output, followed by hydroelectricity and natural gas. With high output and low consumption all the countries of the region can export energy and still maintain reserves.



its natural resources, and during the 18th century the country became a world leader in the production of iron. However, lacking any substantial deposits of coal, it began to lose place once coke replaced charcoal as a more efficient fuel, and Swedish iron production consequently declined from about one-third to 3 percent of world production by the mid 19th century.

Low-cost methods of steelmaking on a mass scale were developed in Europe and the United States in the course of the 19th century. The improved version of the original Bessemer process (which used compressed air to convert pig iron to steel) developed in 1875 by Sidney Thomas (1850–85) made it possible to use pig iron with a high phosphorous content (typical of north European deposits) to make steel. Its introduction into Sweden enabled the huge iron-ore deposits in the north of the country to be exploited for the first time.

Once again Sweden's export of iron and steel products soared, especially after the opening in 1902 of a railroad linking the vast deposits at Kiruna, Gällivare and Malmberget. These lie within the Arctic Circle close to the Atlantic harbor of Narvik in Norway, free of ice all the year round. Norway's largest iron mine, at Kirkenes, in the northeast, was opened in 1906. After the closure of the mines in Norway and Bergslagen, Sweden, in the 1970s and 1980s, the Swedish Lappland mines remain the only producers of iron in the Nordic Countries.

Map of principal resources and industrial zones
Sweden and Norway have significant deposits of metal ores, and both Denmark and Norway have offshore oil and gas fields. Most industrial zones are located on the coast, while mining is concentrated in the interior

Forests and water

Another important ingredient in the industrial development of the Nordic Countries, with the exception of Denmark and Iceland, was the existence of vast forest resources. First exploited to provide charcoal for smelting, lumber was also much in demand in the mines to make pit props, and it was also the region's main building construction material and source of fuel. By 1870 Sweden had become the world's largest exporter of lumber and wood products, and Norway also had a substantial forestry industry.

Timber pulp replaced linen rag as the main raw material for papermaking at the end of the century. Only the Nordic Countries had sufficient forest reserves to meet the soaring demand in Europe. The abundance of fast-flowing rivers played an important role in developing the pulp industry. It provided a means of floating logs from the central forested areas to the processing plants located along the coast of the Gulf of Bothnia, from where pulp could be exported to the rest of Europe. The rivers also supplied hydroelectricity for the industry.

Denmark and Iceland do not share the mineral and timber reserves enjoyed by the other Nordic Countries. Agriculture and fishing lie at the center of their industrial activity. In Denmark, intensive cereal growing, dairy herds and pig rearing have long supported a flourishing food-processing industry. Denmark has also benefited from the discovery of oil in its sector of the North Sea, which now supplies an ever-increasing share of its energy needs. Fishing is Iceland's main natural resource, and is still the mainstay of its industry, though ways are being sought of diversifying into other areas.

AN EMPHASIS ON ENGINEERING

From very early days industrial development in Sweden and Norway was led by the mining companies. They began the industrialization process, and opened it up in new directions. Commercial sawmill production was originally started by the mining companies near their metal and mining centers in the 17th century, and it quickly became the driving force behind the region's exporting industries. Unlike the iron industry, where competition from other countries was severe, the Scandinavian sawmills enjoyed a paramount position in the European market, owing to the size of their forest reserves and competitive prices.

The iron and steel companies – by virtue of their control over huge areas of forest – were also intimately involved in the move that took place in the industry from lumber to pulp production when the demand for the former stagnated in the 1890s. Early examples of companies involved in both iron production and pulp processing were STORA and Uddeholm. STORA today is one of two giant companies (the other being SCA) that dominate Swedish forestry, and is one of the largest forest companies in the world.

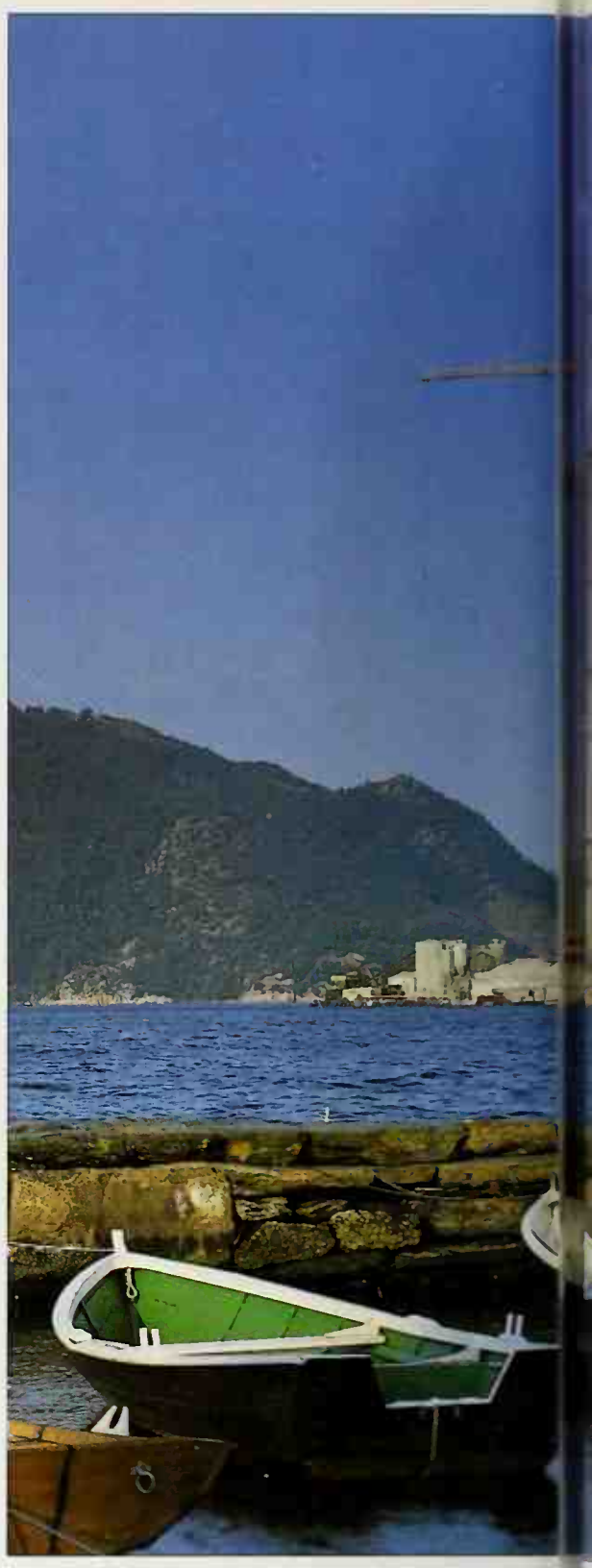
Change in the metal industries

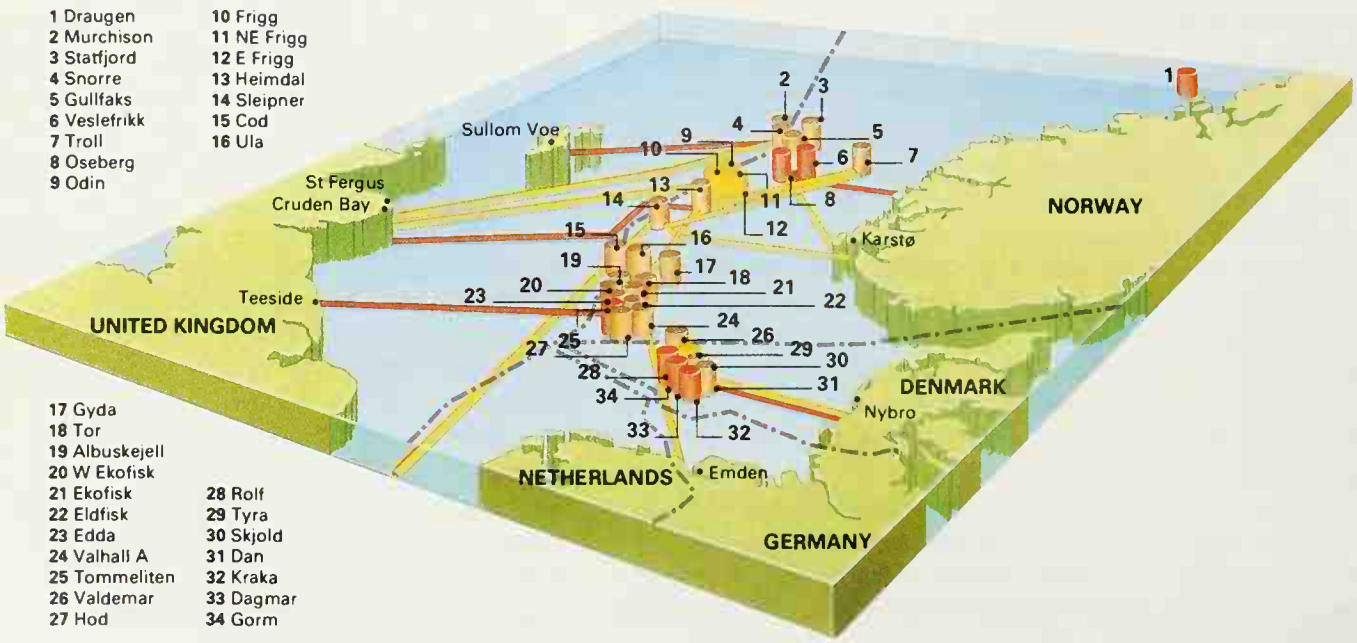
In the 20th century the expertise gained in refining steel and other metals was successfully extended to the production of aluminum. This metal is refined from bauxite into alumina, a powder which is then smelted by electrolysis into aluminum using a very high input of electricity. The industry therefore developed in Norway after World War I, when cheap sources of hydroelectricity were readily available. Alumina was imported from Jamaica and most of the plant was foreign-owned. Norway is now the largest aluminum producer in Europe, with refineries in the west and southwest. In its drive to find new areas for industry in the late 1960s, Iceland also started an aluminum refinery. This is supplied by alumina from northern Australia.

Both Norway and Sweden now also specialize in the refining of ferro-alloys, metals such as manganese, chrome and silicon that are alloyed with iron and used in the manufacture of alloy steels. Sweden was an early pioneer in this sector of the steel industry, with companies such as Sandvik and Avesta leading the way. Sandvik continues this tradition by making products in cemented carbide, a combination of very hard materials used in mining and drilling.

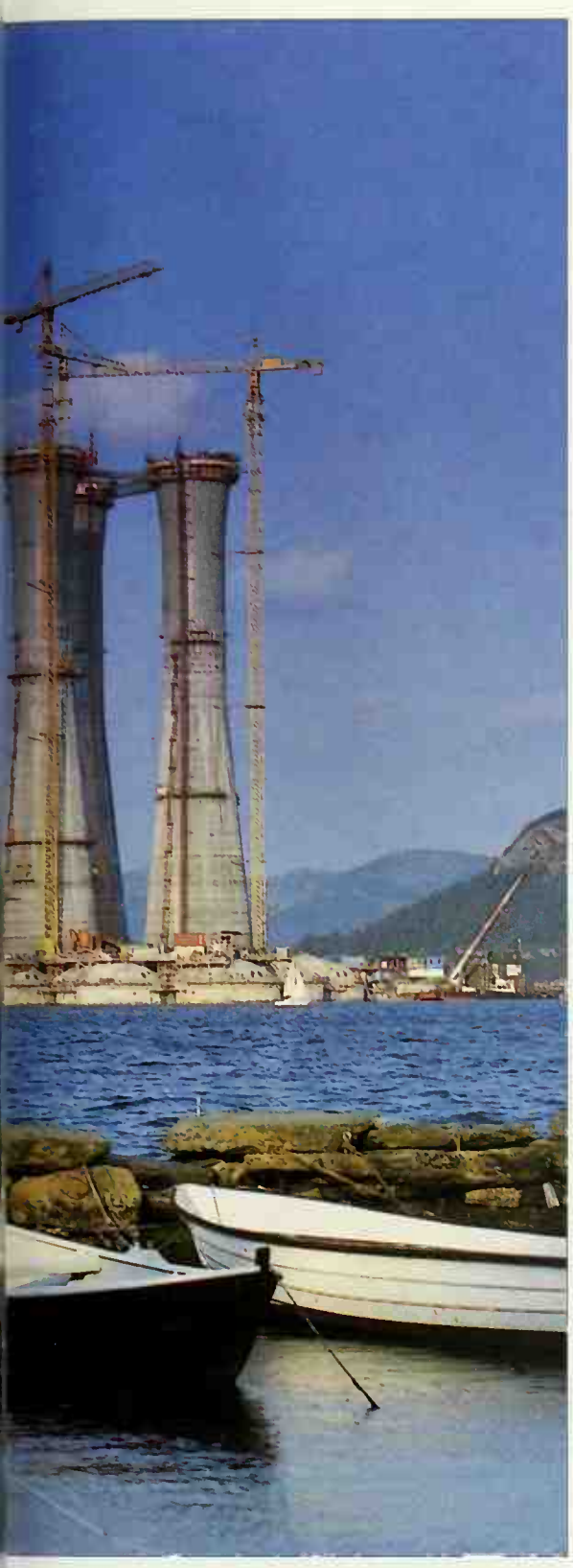
Engineering gains primacy

In recent years industrial production in the region has been dominated by the manufacture of machinery, along with transportation vehicles and equipment: today this sector is by far the largest contributor to exports. The development of the engineering industry in the late 19th century was closely linked to the mining and metal industries. Traditionally there has always been a high degree of cooperation between companies involved in different stages of the extraction and manufacturing processes; for example, between those involved in mining iron





Staking their claims in the North Sea *(left)* The North Sea contains the ninth largest reserves of oil in the world. Although the British sector covers the widest area, the largest known reserves of both natural gas and oil are in the Norwegian sector. Norway and Denmark now supply most of the region's oil. The offshore fields are particularly valuable to Denmark since the mainland lacks other fossil fuels and minerals.



ENERGY FROM THE ROCKS

Iceland lacks mineral deposits, but it possesses vast natural resources of energy. Only about 10 percent of the hydroelectric potential of its rivers has been tapped, and it is able to harness energy from the many hot springs and geysers that occur naturally.

Geologically young – much of its rocks were only formed during the last 10,000 years – Iceland is a volcanically active area. This means that heat from natural radioactivity, which keeps rock in a molten state below the Earth's crust, usually at depths of about 30 km (18 mi), rises close to the surface to heat underground water. It then escapes in the form of hot springs, geysers or fumaroles (vents of gas or steam).

Iceland contains more of these features than any other country in the world, and the heat from their waters is used to provide domestic space heating for nearly 80 percent of the population. As steam it heats greenhouses for commercial fruit and vegetable farming, and provides the energy for Iceland's developing industries, including a plant that refines sedimentary deposits from lake Mývatn. These contain the shells of microscopic aquatic plants, or diatoms, which are treated to make pure diatomite, a material that has many uses – as an industrial filter, as an extender in paints, ceramics, bricks and other products, and to insulate boilers and blast furnaces.

ore, in steelmaking, in the production of carbides, and in the manufacture of mining and drilling equipment.

After World War I the presence of a steelmaking industry producing high-quality sheets promoted the rapid development of shipbuilding in Sweden and Norway, and of an automobile, truck and aircraft industry run by companies such as Volvo, Saab and Scania-Vabis. Sweden also specialized in the production of armaments, such as the Bofors antiaircraft guns. In Denmark, local demand gave rise to an engineering industry manufacturing specialist diesel engines for ships and other vessels. The Danish also specialize in producing machinery for the dairy, meat and cement industries.

Finland did not develop any significant heavy industry until after World War II when, faced with paying heavy war reparations to the Soviet Union, it rapidly expanded its industrial base. Close economic ties were forged with the Soviet Union at this time. For example, Finland specialized in building heavy icebreakers for use by Soviet fleets in Arctic waters. There are also links with the Soviet oil refining and petrochemical sectors. The Finnish state-owned company Neste was founded to process and distribute fuels produced by the Soviet oil industry. Today it is an international conglomerate.

In the absence of coal reserves, hydroelectricity was the region's main source of energy for industrial and domestic consumption until the second half of the 20th century. Since World War II there has been a significant nuclear power program, especially in Sweden and Finland, where nuclear power is now more important than hydroelectricity. In the mid 1970s Norwegian and Danish oil and natural gas reserves in the North Sea were opened up, and these fields now supply most of the oil consumed within the Nordic Countries.

The growth of the petroleum industry has had far-reaching effects in Norway. By 1980 the revenue from exports of crude oil and natural gas had come to equal the combined value of its traditional exports. The oil industry also helped to keep alive the heavy-engineering sector, which was then facing a decline in demand for shipbuilding – Norway's traditional engineering strength – by enabling a switch to be made into manufacturing equipment such as oil rigs and platforms.

Oil rig construction at Stavanger (*above*) Norway's major port and fourth largest city was once an important shipbuilding center. In the early 1970s 10 percent of the world's tonnage was carried on Norwegian vessels. Now Stavanger is the heart of Norway's oil industry and a related manufacturing sector has sprung up, specializing in drilling equipment, oil rigs and platforms.

Wood, a versatile resource (*right*) Scandinavian furniture is prized by affluent consumers all over the world for its sleek contemporary lines. Timber is plentiful in Sweden, Norway and Finland, where fast-flowing rivers make its transport easy and cheap. However, it is Denmark that has developed the most prestigious furniture and design industry.

THE DRIVE TO EXPORT

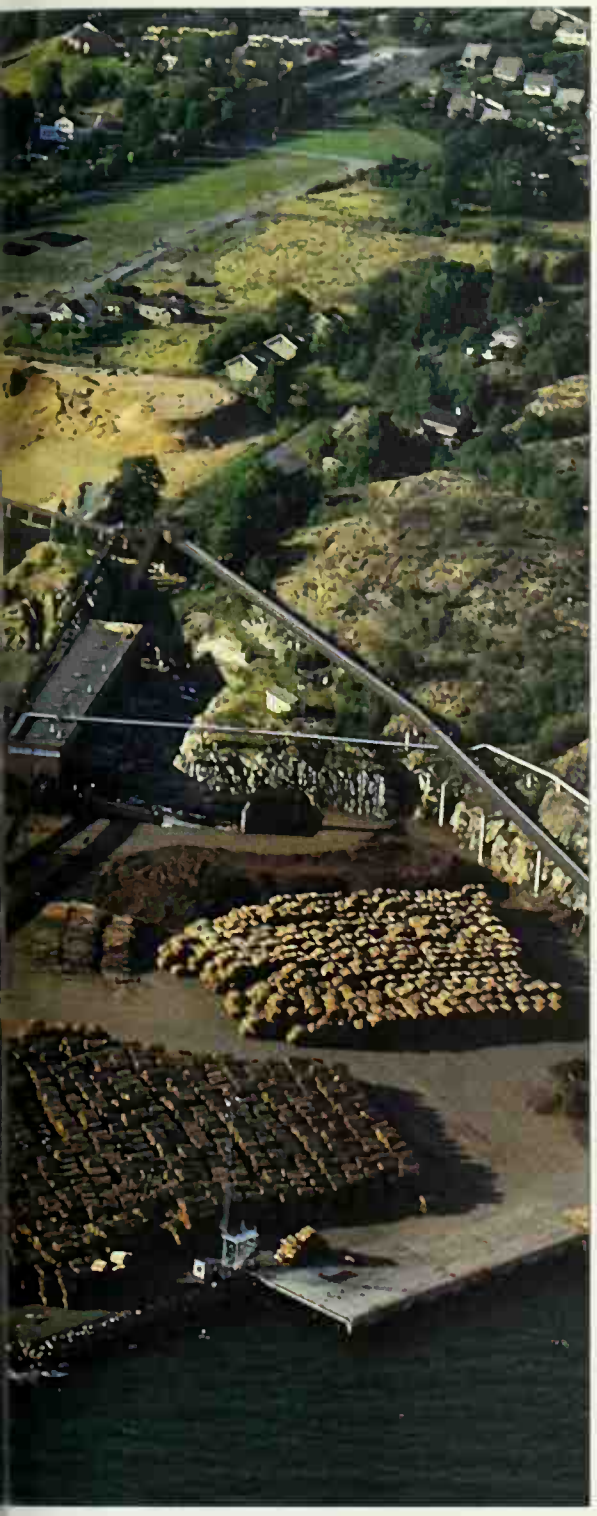
With their comparatively small populations, the Nordic Countries have always had to rely on exports in order to run their industries at full capacity. They were not early centers for technical innovation within the mining and metal industries. Sweden's preeminent position in world steelmaking was due to the suitability of local ores, and other conditions, for mass production methods. Technical know-how, as well as the capital to develop the industry, were originally imported from elsewhere in Europe, particularly Britain, Germany, France and Belgium. The provision of capital generated by banks and trading houses involved in forestry and metal exports further enhanced industrial expansion, and as skill and expertise grew a talent for innovation developed.

Successful Swedish technical patents taken out about the 1890s laid the foundation for many of today's giant export companies. These include the milk separator and the steam turbine, which were developed by Alfa Laval and ASEA respectively, the safety match by Swedish Match, the self-aligning ball bearing by SKF, the gas accumulator for automatic lighthouses by AGA, the air compressor by Atlas Copco, instruments for precision measurements by C.E. Johansson and the welding technique by ESAB.

Famous Nordic industrial entrepreneurs include the Swedish chemist and engineer Alfred Nobel (1833–96), who invented dynamite and other powerful explosives and bequeathed his considerable fortune to establish the international Nobel awards. Norwegian entrepreneurs were particularly active in the founding of the Finnish forest industry, for example in the development of the largest company, Enso-Gutzeit. The Norwegian Hans Gutzeit (1836–1919) established his sawmill at Kotka, southern Finland, in 1872. In 1896, it became a Finnish company, and in 1918 the Finnish government assumed control.

An integrated industry (*above*) Pulp mills are often located on the coast, where hydroelectric power is easily harnessed to run them. Since wood pulp replaced linen in papermaking, much Nordic timber has been sent to papermills. Finland's mills are the largest and most modern in the region.

Packing frozen fish (*right*) Fish is a staple of the Nordic diet and a long-standing export product. Refrigeration and freezing now keep this perishable product fresh. Norway alone now exports more than 100,000 tonnes of fresh fish annually, including 15,000 tonnes to the United States by air.



THE PAPER INDUSTRY

Paper is made by separating the cellulose fibers present in plants; these are wetted to produce pulp, which is suspended in water and filtered on a wire screen to form a sheet of fiber. This is then pressed and dried. Since the end of the 19th century, wood pulp has been the chief constituent of paper, especially newsprint, and Sweden and Finland have been major exporters of wood pulp for the world paper industry. Sweden's pulp manufacture peaked in the 1950s, with more than one-third of the world's total pulp exports and 10 percent of world production. The combined Nordic share of world pulp production is now 14 percent.

Until the 1970s, tariff barriers were imposed by the rest of Europe to restrict exports of paper from the Nordic Countries in order to protect their own paper production. Papermills in Sweden, Norway and Finland supplied mainly the local market, but with the lifting of these barriers they began to manufacture paper, particularly newsprint and paperboard, for the international market. By 1990 the Nordic share of the world production of newsprint had risen to 14 percent, the same level as for pulp exports, and was 8 percent for paperboard.

Much of this production is centered in central Sweden and southeast Finland. Finland's forestry industry developed later than that of Norway or Sweden, but grew tremendously in the 1950s and 1960s.

Increasing confidence

As the engineering and manufacturing industries expanded in the first half of the 20th century, many foreign innovations were adapted and then developed by Swedish companies. Among these a three-phase system for transmitting electrical power more efficiently over long distances was developed by ASEA; Scania established an expertise in heavy truck manufacture and Ericsson specialized in telephone exchanges. Capital for such research development and expansion was provided by European investors.

Some companies, such as the Swedish automobile company Volvo when it was founded in 1926, were dependent on foreign materials as well as technology. Volvo gradually substituted imported goods with Swedish manufactured engines, transmissions and other components and by the 1950s it had launched an export drive. Because of heavy competition in European and, later, North American markets, Volvo was forced to maintain top quality together with high productivity. It also faced strong competition in the home market from Saab automobiles and Scania buses and trucks. This situation further strengthened the competitive edge for Volvo and Saab–Scania, who are now both world leaders in heavy truck manufacture.

The drive to increase the volume of foreign trade from industrial exports is strong in all the Nordic Countries, but since the 1960s Denmark has made particular efforts to decrease its reliance on its agriculture and food-processing industries by expanding its manufacturing output in areas such as machinery and transportation equipment, clothing, footwear and furniture.

A skilled, well-organized workforce

The industrial and exporting success of the Nordic Countries has grown side by side with the creation of a well-motivated workforce. Industrial welfare clauses, such as the provision of accident and health insurance for workers and fixed-hour working days, have long had legal enforcement in the region. Most countries have well-organized workers' and employers' associations. In Iceland, for example, 9 out of 10 workers belong to trade unions or employee organizations.

Most industries are privately owned. Sweden has many cooperative enterprises, such as SSAB (Swedish Steel AB) and LKAB (iron-ore mines). Its more important wholly state-owned industries are now organized into one giant concern, Procordia, co-owned with Volvo, giving the state considerable influence in industry. In late 1991 the new nonsocialist government launched an extensive privatization program.

Norway has only a few large state-owned concerns, notably Statoil and Norsk Hydro. These enjoy considerable independence in their management. Many small private businesses are family-owned; the rest are joint-stock companies. About 10 percent of production comes from foreign-owned companies. Fewer than 5 percent of companies have more than 100 employees. This 5 percent employs half the industrial labor force and generates more than half the country's industrial production.

The Volvo model

Volvo's automobile factory at Uddevalla, 80 km (50 mi) north of its main operations in Göteborg, southwestern Sweden, is very unusual. Its production techniques, which were radically new when the factory opened in 1988, are based on a novel form of work organization designed to motivate staff by giving them personal involvement in all stages of making a complete automobile. The more usual conveyor-belt method of automobile production, in which each worker repeats one or two specialized tasks all day long, has been rejected.

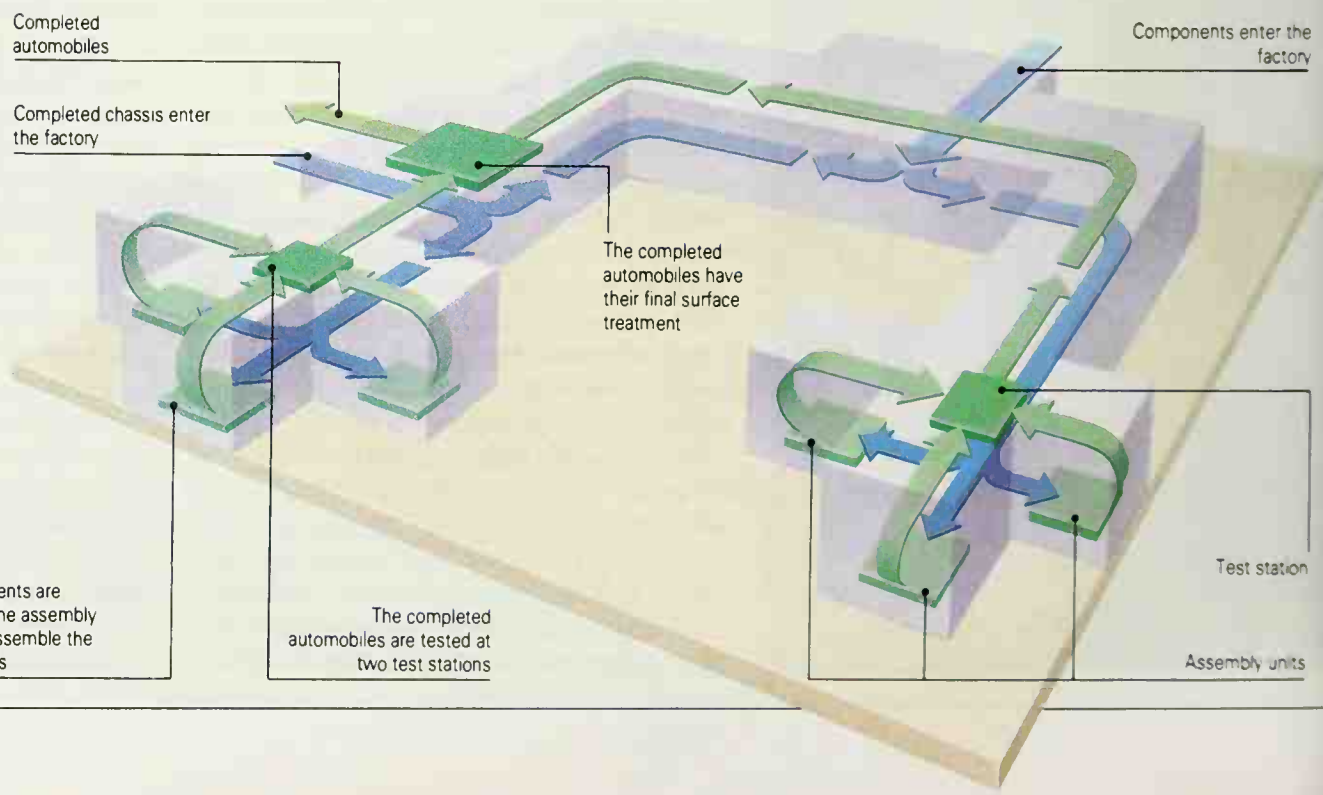
Within the Uddevalla factory are six separate "factories", known as product shops. These are more independent of each other than are traditional departments along a conveyor-belt production line. In each product shop, there is a product leader and eight different work teams, each producing a separate automobile. There are usually ten people in every work team, and each member performs a wide range of tasks, including administration. Each work team plans together how the work is to be organized, so every member takes responsibility for their own part of the operation. This procedure reduces the amount of stress and boredom that assembly-line workers typically experience.

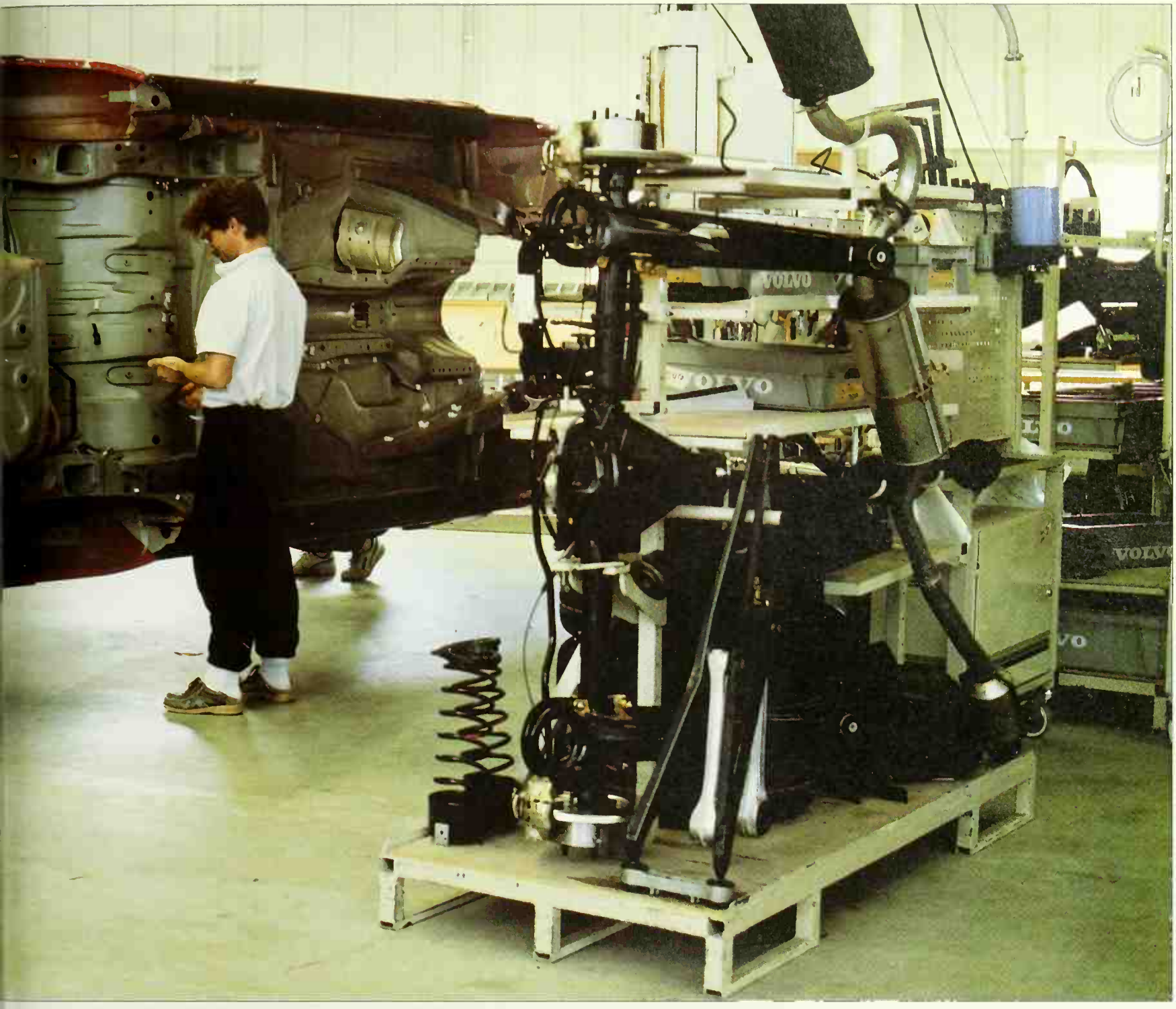
If a completed automobile is found to be faulty, it is put right by the team that built it. This ensures that every employee is quality conscious, creating pride in his or her work. Every member takes it in turn to be spokesperson for their particular work team. In this way, all employees are involved in decision making,

A model product shop (*far right*) Workers at Uddevalla demonstrate the success of Volvo's social and industrial experiment. Their tasks promote teamwork, personal accountability and superior quality control. Assembling complete vehicles involves workers with the total product. The factory is clean and pleasant, and interaction prevents boredom and isolation

Modern technology at work (*right*) The worker who uses the computer may also be the one who fits wheel bearings. Training in all aspects of production lessens the division between highly skilled and less skilled workers. Volvo has also introduced a sorting machine to make up component kits, believing that the workforce should not be wasted on tasks that can be handled by machines.

A revolutionary assembly plan (*right*) On an old-fashioned production line the chassis moves along to different fitting stations. At Uddevalla, however, the chassis is delivered to one of six separate teams and remains stationary. Parts are brought to it on an automated trolley. Finished cars are tested at one of the two test stations on the upper level. Final surface treatment includes paint finishing, rustproofing and undersealing.





and there are relatively few levels of management between the plant manager and the automobile workers.

Care is taken to create work teams that mix men and women of different ages according to their compatibility and range of skills. The right balance is vital to give work teams a sense of identity and promote individual job satisfaction. Every employee is gradually trained to master all, or nearly all, the different tasks needed to produce an entire automobile.

Smaller is better

Increases in efficiency of the labor force have been one of the key successes to result from these innovatory production methods. Greater job satisfaction reduces the high rate of labor turnover that factories using conveyor-belt production lines normally face, and injuries at work are fewer once workers are released from boring, repetitive production-line tasks that do not allow individuals to realize their potential and think for themselves.

Sweden's school-leavers are now educated to such a level that they are reluctant to accept the kind of work tasks that the automobile industry traditionally offers. The success of the Volvo model at the Uddevalla factory in attracting and keeping workers shows that people at work want to be able to use their brains as well as their hands. In 1990 workers at the Uddevalla factory built only 20,000 units, though it has the potential capacity for 60,000 a year. However, the better utilization and motivation of its human resources has resulted in better quality products with a worldwide reputation, an advantage that needs to be balanced against the supposed economic advantages of largescale production.

Volvo's current approach is to provide customers with automobiles that give them maximum quality and the option of different finishes and equipment. This aim is incompatible with largescale production, where economy of scale is achieved by manufacturing a uniform product. Lower productivity results when different products have to share the same assembly line. Once customer satisfaction (and the willingness to pay for a superior product) is placed at the center of the manufacturer's operation, then smaller plants are more efficient than larger ones. The Uddevalla plant may become a model for the future organization of manufacturing production.

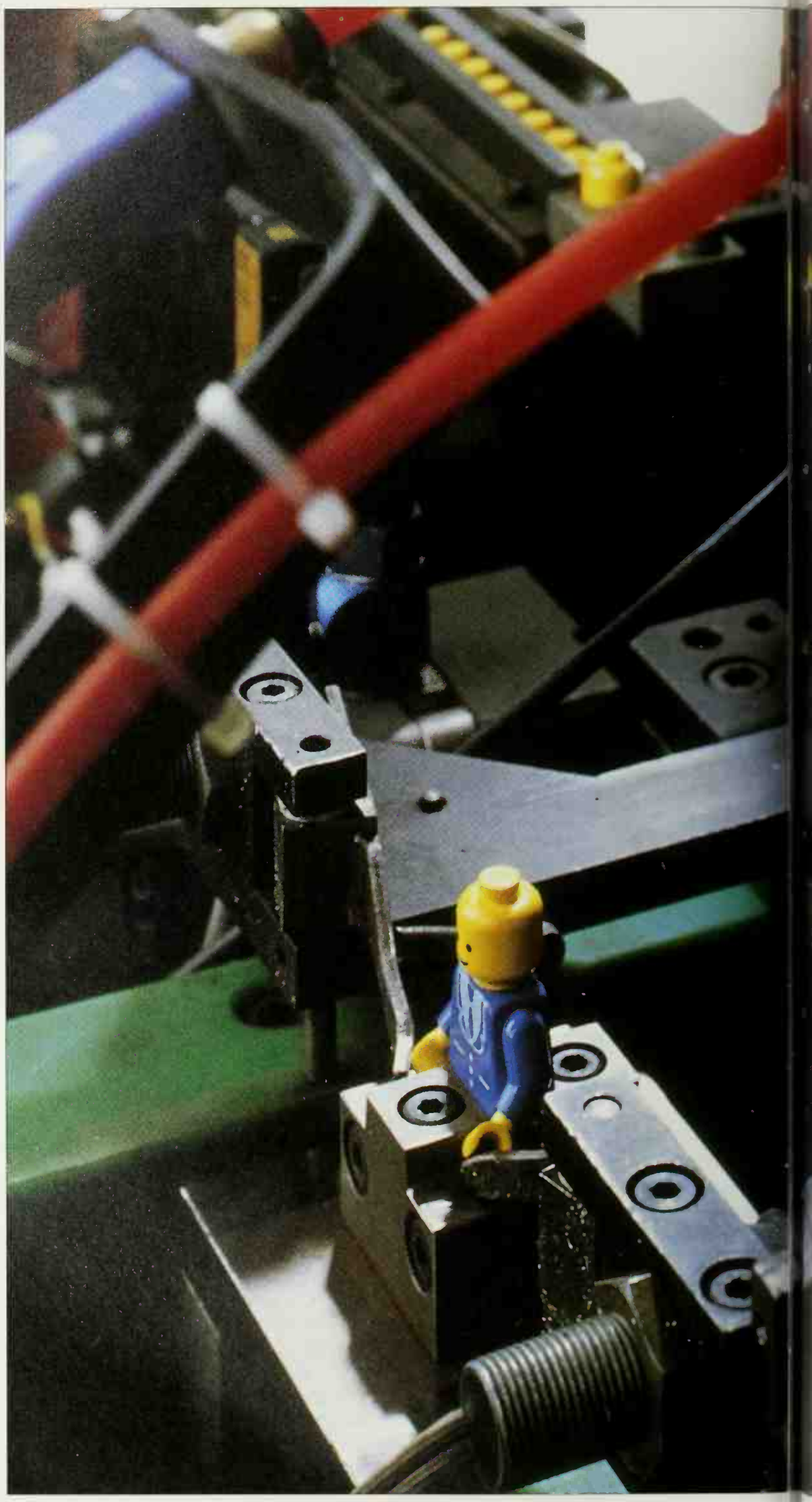
Putting the pieces together

Lost among the momentous political and social changes that were taking place in Europe in the wake of World War II, a small Danish company in 1949 introduced a toy that would revolutionize children's play. Ole Kirk Christiansen's toymaking company had produced its first plastic LEGO brick. Today the LEGO Group comprises 36 companies on 5 continents; since 1949 more than 300 million people will have played with the famous LEGO bricks.

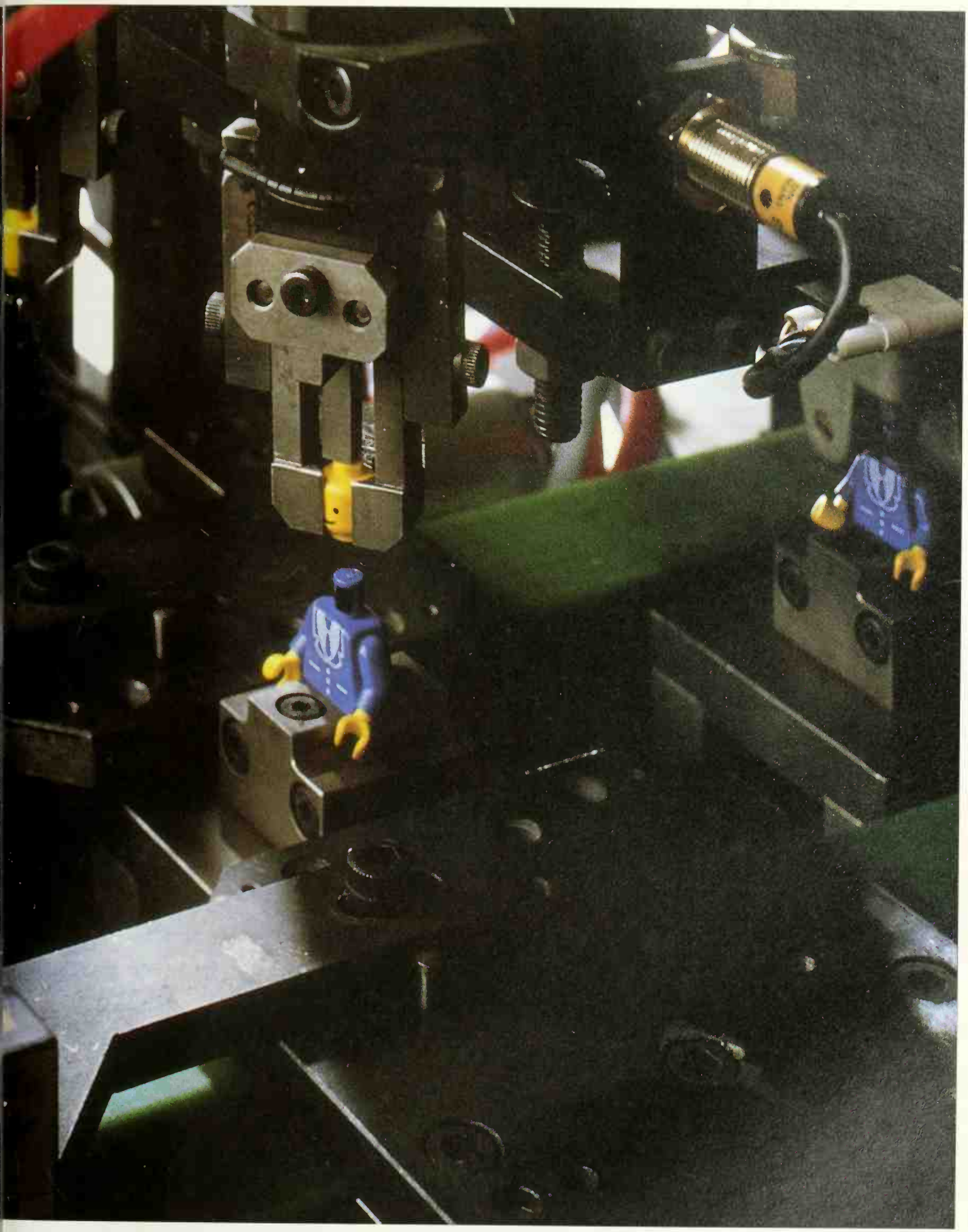
The basic bricks are molded plastic blocks that have built-in studs and tubes. The clutching power of the studs allows children to build the LEGO bricks into shapes of their own design. Two 8-stud bricks can be put together in 24 different ways and 6 bricks have a remarkable 102,981,500 combinations.

At LEGO's five molding factories, the plastic granules are heated to about 225°C. Molding is done under pressure that can vary from 25 to 150 tonnes, depending on the components. It takes between 7 and 10 seconds to mold, cool and extrude one batch of LEGO components out of their molds, and then the process starts again.

After the extrusion process, the molded items are sent for decoration or assembly. Components are decorated in automatic printing machines, and the decorated components are joined together in the assembly departments by specially designed and constructed machines. Assembled components are packed and shipped to local distributors around the world. The largest LEGO factory can produce more than 60 million sets each year.



Head and shoulders above the rest One of LEGO's 1,300 different molded product models marches off the assembly line. A truly international company, most of the machines used are made in LEGO's German and Swiss factories



ECONOMY

FOUNDATIONS OF WEALTH · SECURING THE FUTURE · WELFARE AND WELL-BEING FOR ALL

A skilled workforce, valuable exports and (except in Denmark) well developed energy production have helped to make the Nordic Countries some of the wealthiest regions in the world. Most of the population enjoys a high standard of living, but they pay for sophisticated education, health and welfare systems with high taxes. The region has a tradition of competitive exporting and has been quick to harness new technology. However, its divided approach to the European Community (EC) threatens the future. By 1992, only Denmark had joined and Sweden was negotiating membership. Finland's economy has been particularly affected by the traumatic changes in the former Soviet bloc. All countries will need to diversify their economies and develop new markets if they are to maintain prosperity.

COUNTRIES IN THE REGION

Denmark, Finland, Iceland, Norway, Sweden

ECONOMIC INDICATORS: 1990

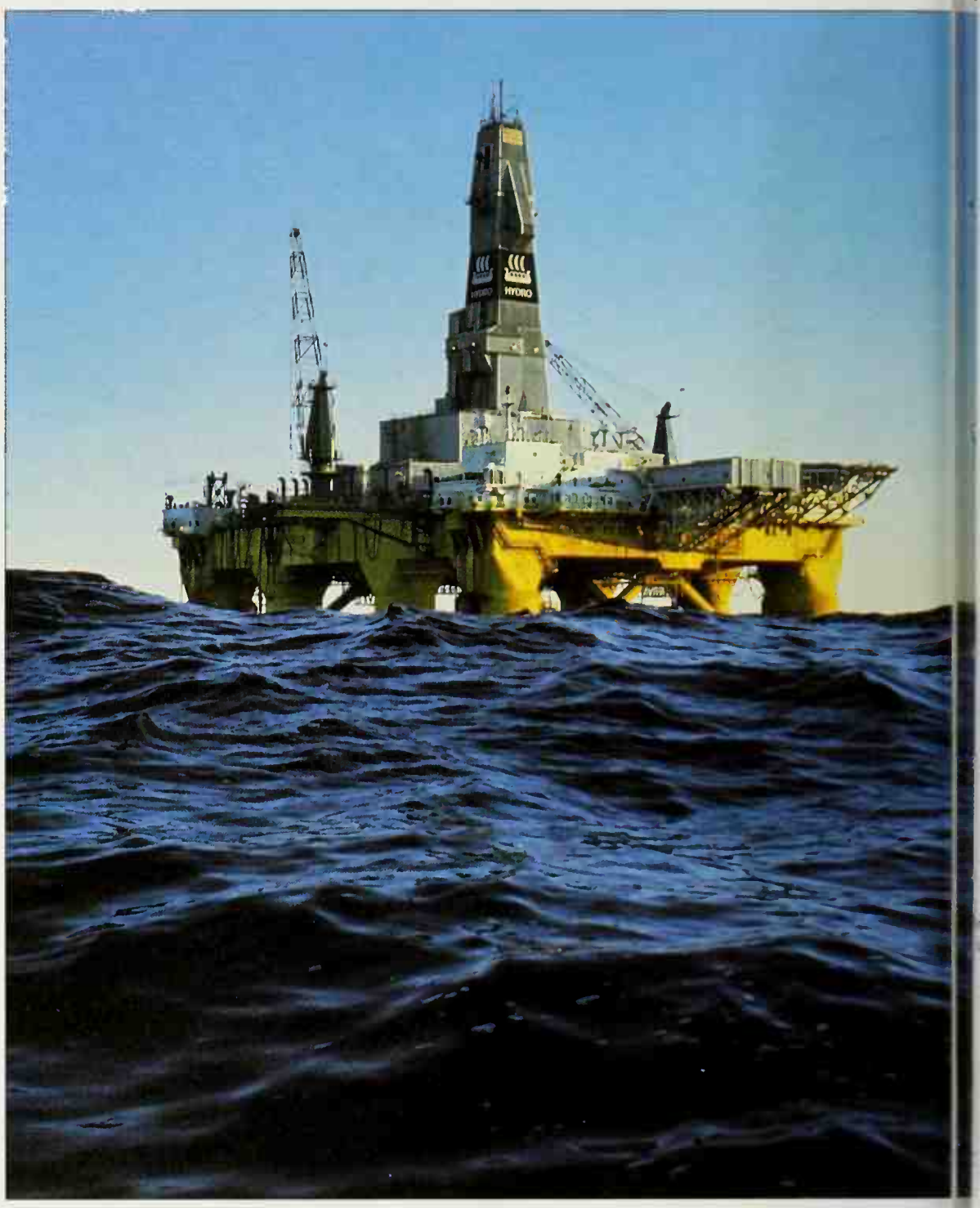
	HIE* Denmark	HIE* Norway	HIE* Sweden
GDP (US$ billions)	130.96	105.83	228 11
GNP per capita (US$)	22,080	23,120	23,660
Annual rate of growth of GDP, 1980–1990 (%)	2.4	2.9	2.2
Manufacturing as % of GDP	20	15	24
Central government spending as % of GNP	41	46	42
Merchandise exports (US$ billions)	35.0	33.8	57.5
Merchandise imports (US$ billions)	31.6	27.2	54.7
% of GNP donated as development aid	0.93	1.17	0.90

WELFARE INDICATORS

Infant mortality rate (per 1,000 live births)			
1965	19	17	13
1990	8	8	6
Daily food supple available (calories per capita, 1989)	3,628	3,326	2,960
Population per physician (1984)	400	450	390
Teacher–pupil ratio (primary school, 1989)	1 : 12	1 : 16	1 : 16

Note. The Gross Domestic Product (GDP) is the total value of all goods and services domestically produced. The Gross National Product (GNP) is the GDP plus net income from abroad

** HIE (High Income Economy) – GNP per capita above $7,620 in 1990.*



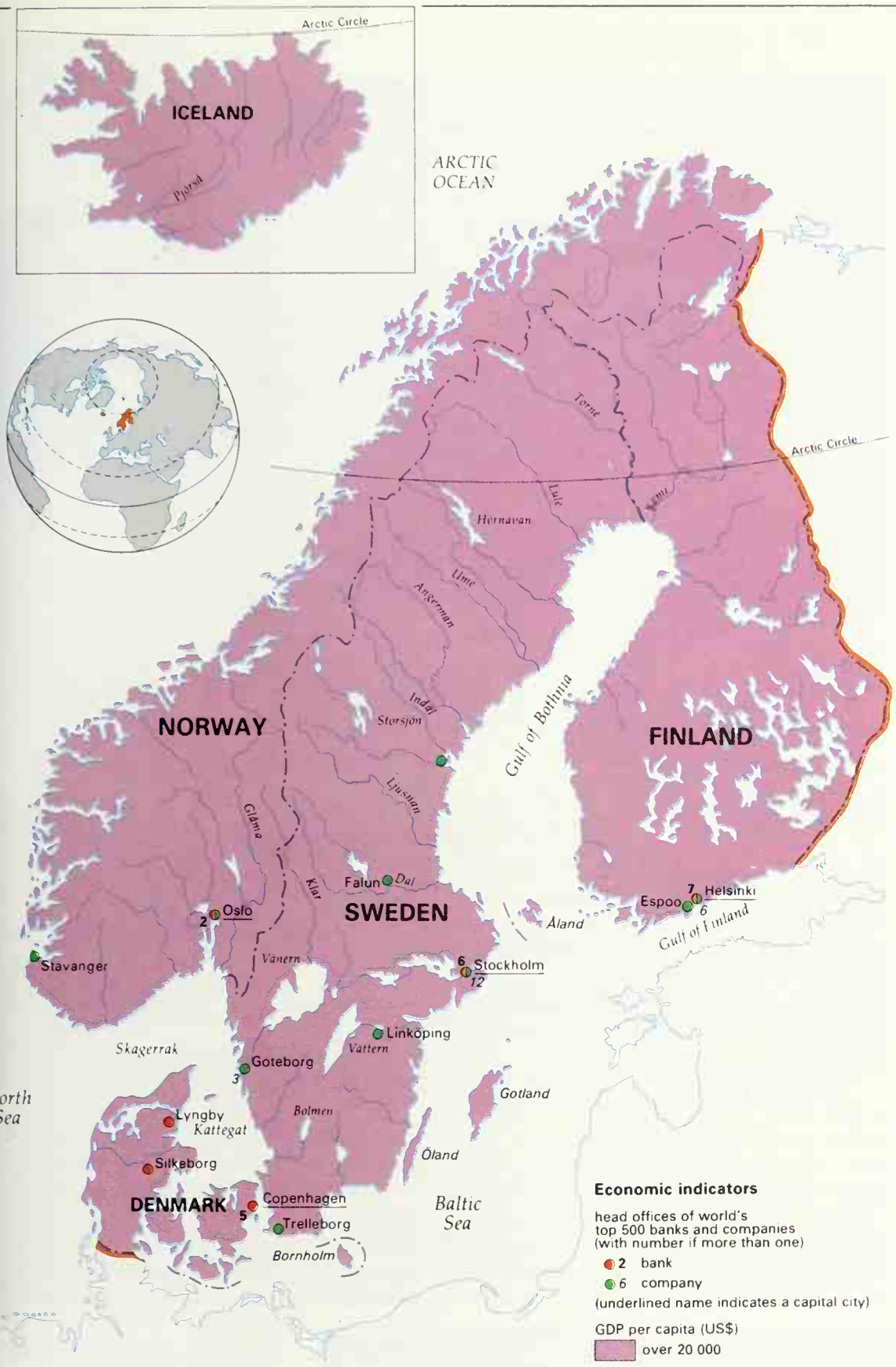
Fueling the economy (*above*) The Norwegian oil industry has helped the country to achieve remarkable prosperity, with a higher per capita GDP than the United States or Germany.

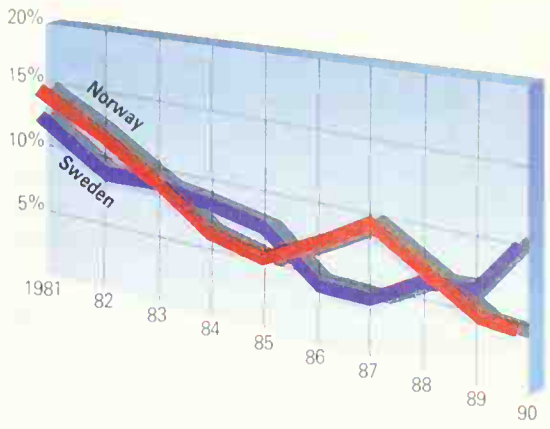
FOUNDATIONS OF WEALTH

Sweden's early wealth derived from its mining industry, which began in the 13th century and dominated Swedish exports for 200 years. Swedish silver, copper and iron figured prominently in trade with the Hanseatic League, the powerful merchants' association of northern Germany. Norway too exported significant amounts of copper and iron, as well as timber and fish, from the mid 16th century. Denmark, like the rest of the region, remained almost exclusively agricultural. Feudal landowning patterns persisted well into the late 18th century, delaying the development of a modern farming industry.

Coping with competition

The 19th century was a period of hardship throughout the region. Economic crisis coincided with increasing competition from North American products, particularly Canadian timber and grain, in British and other European markets. By 1840 the crisis prompted mass emigration, chiefly to the United States and Canada.





Profile of inflation (*above*) During the early 1980s Norway and Sweden both experienced falling inflation, but by 1990 Sweden's seemed set to rise again.

Map of GDP per capita (*left*) Finland had the region's highest GDP per capita in 1990, though every country in the region ranks in the world's top 10. Oslo, Copenhagen, Stockholm and Helsinki are the leading commercial centers

Bad harvests in the late 1860s increased the exodus; by 1920, a total of 2.7 million Scandinavians – 17 percent of the population – had emigrated. In response, governments in the region prompted export-led recovery by developing new technologies for their primary sectors: fishing in Norway, Iceland and the Faroes; dairy-farming and pig-rearing in Denmark; and wood-pulp production in Norway, Sweden and Finland.

Reverberations of war

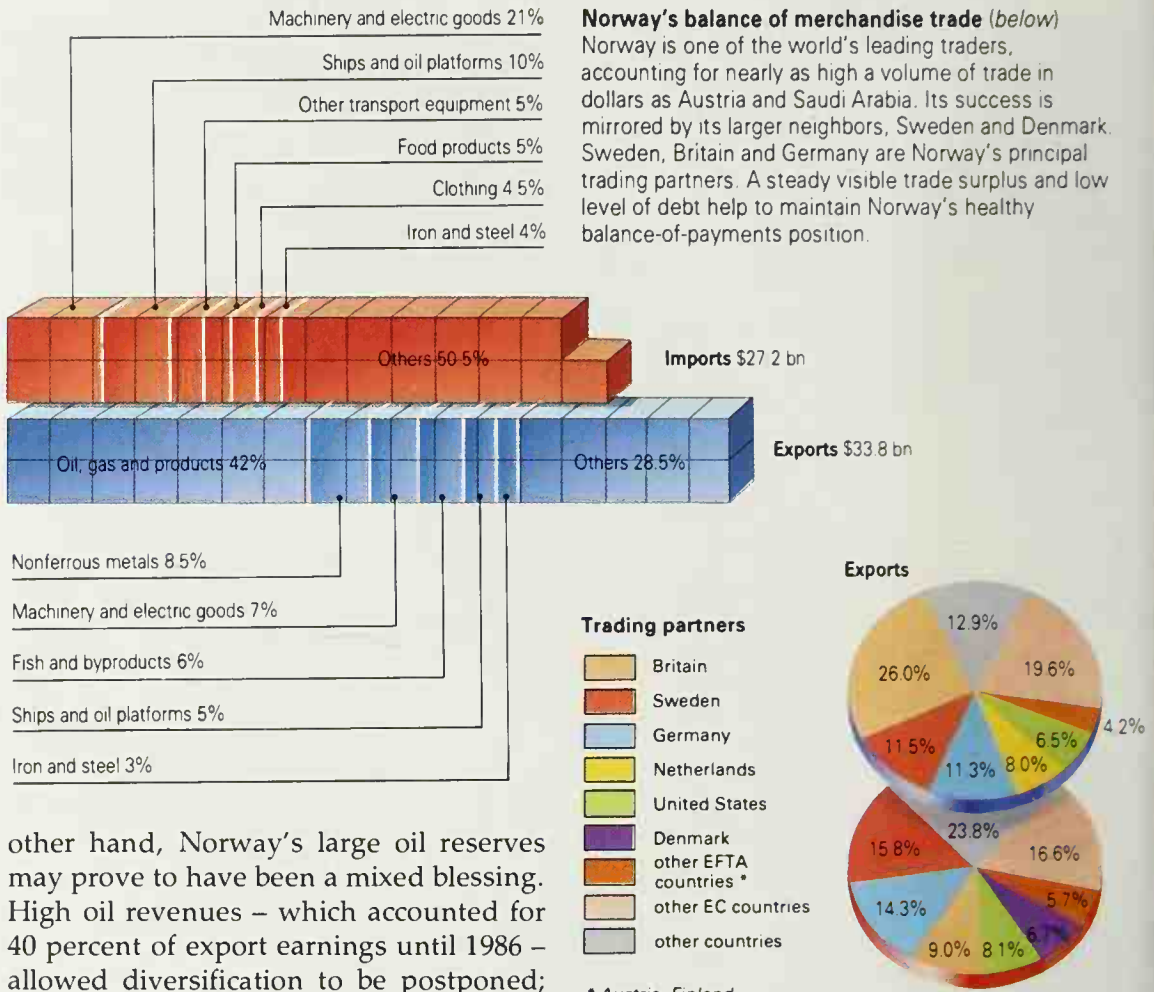
Economic growth was interrupted by the Great Depression (1929–33), and a decade later the economies of Denmark and Norway suffered under German occupation during World War II. Sweden remained neutral in the war and profited from supplying iron ore and ball bearings to the German war machine. The fishing industries of the Faroe Islands and Iceland profited from the other side by supplying food to the British and American naval bases stationed there. Finland, which had sided with Germany to resist the strategic claims of the Soviet Union, lost territory and resources in the peace settlement following the Red Army's expulsion of Nazi forces. Finnish reparations payments made up four-fifths of the country's exports in the immediate post-war years. While increased demand stimulated the Finnish economy, it also encouraged excessive reliance on the Soviet market.

In 1950 agriculture still employed half of the Finnish male workforce, a third in Norway and Denmark and a quarter in Sweden. An international shift in trade away from primary goods and toward secondary goods soon produced a fresh challenge to the Nordic economies. The region responded by diversifying its economies into increased industrial development. From 1945–1960, industrial growth was greatest in those countries which had suffered most war damage: sixfold growth in Norway and Finland, and fivefold growth in Denmark. Industrial expansion in Sweden also proceeded quite rapidly: output in 1969 was three-and-a-half times its 1945 level, with Swedish cars and engineering in particular claiming new world markets. Finland continued to provide metals and wood pulp to the Soviet Union and its satellite economies.

With the exception of Norway, all the region's economies became very heavily dependent on oil imports during the postwar decades. In 1970 petroleum and related products accounted for over 10 percent of the value of all imports to Denmark, Finland and Iceland. These countries were badly hit by the oil price rises imposed by the Organization of Petroleum Exporting Countries (OPEC) during the 1970s. Norway was protected from the shock by the development of its North Sea oilfields in the late 1970s, which became a significant earner of foreign revenue.

SECURING THE FUTURE

The Nordic Countries are modern, urbanized societies that enjoy high standards of living and economic performance. Oil has been the key to Norway's emergence as one of the world's most prosperous countries. Between 1965 and 1988 Norway's gross national product (GNP) per capita grew by 3.5 percent a year, ranking the country alongside Japan, Switzerland and the United States. Tight economic management by the Soviet-aligned government of Finland produced a similarly healthy growth rate of 3.2 percent over the same period. While economies in other parts of the world grew more slowly, in 1990 Norway, Denmark, Sweden and Finland maintained their position (in terms of GNP per capita) among the top seven most prosperous nations in the world.



Norway's balance of merchandise trade *(below)* Norway is one of the world's leading traders, accounting for nearly as high a volume of trade in dollars as Austria and Saudi Arabia. Its success is mirrored by its larger neighbors, Sweden and Denmark. Sweden, Britain and Germany are Norway's principal trading partners. A steady visible trade surplus and low level of debt help to maintain Norway's healthy balance-of-payments position.

Reaching out to Europe

About 25 percent of all Nordic production is exported to meet the costs of essential imports. The relatively small Nordic economies must continue to diversify and capture new markets if they are to sustain their profitability. Sweden has diversified most successfully: one-seventh of its exports consist of cars and lorries, mostly from the prestigious Volvo factories, and it also exports significant amounts of high-grade iron and steel to Europe. The country has reduced its reliance on imported oil by extending its hydroelectric power capacity. Iceland has also substituted some imported oil with increased geothermal energy production. On the other hand, Norway's large oil reserves may prove to have been a mixed blessing. High oil revenues – which accounted for 40 percent of export earnings until 1986 – allowed diversification to be postponed; after prices fell in 1986, Norway's dependence on oil revenues began to appear increasingly dangerous.

The search for new markets in the 1980s saw a shift in exports from a mainly British to a broader European market. In 1992, all countries were members of the European Free Trade Association (EFTA), though only Denmark was a member of the European Community (EC); Sweden has applied to join in the mid 1990s. The EC now accounts for 30–40 percent of Nordic exports and some analysts consider that it is only a matter of time before all the Nordic Countries apply for EC membership, Britain remains the most important single customer, receiving 26 percent of Norway's exports, 20 percent of Iceland's and just over 10 percent of the other countries' exports. The United States takes about 14 percent of Iceland's exports but is not an important customer for the rest of the region.

In the late 1980s, the collapse of the uncompetitive Soviet market left Finland with outmoded industries and reduced demand from a formerly loyal and undemanding customer. In 1991, the gross domestic product (GDP) of Finland suffered a 6 percent fall as a result of lost Soviet markets. On the other hand, the Nordic Countries are beginning to look toward Eastern Europe as a market with obvious new potential.

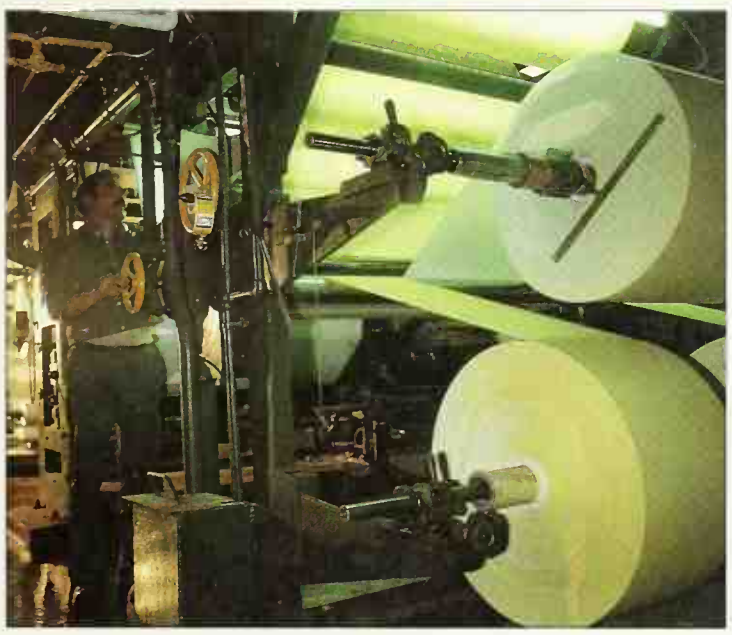
The squeeze on social spending

During the 1980s most Nordic governments continued extensive intervention in their economies, as a means of maintaining fullish employment and high standards of living. Unemployment in

THE INS AND OUTS OF TOURISM

Tourism is an increasingly important source of revenue in the region. In 1989, it provided the equivalent of about 2 percent of GDP in Denmark and Iceland, 1.5 percent in Norway and Sweden, and 1 percent in Finland, despite the fact that the Nordic Countries are comparatively expensive places to visit. The number of tourists to Norway, Sweden and Denmark remained fairly constant between 1984 and 1989. By contrast, Finland and Iceland, more unusual destinations for Western tourists, welcomed 80 percent and 50 percent more tourists respectively over the same period. However, the people of the Nordic Countries still spend more money abroad as tourists than their countries earn from visitors.

Holiday travel within the region itself is also popular. Norwegians are the most common tourists in Sweden, Danes in Norway, and Swedes in Finland. Germans are the most numerous visitors to Denmark, accounting for a third of its total number of tourists in 1989. By attracting a wider international tourist base, the region hopes to gain some protection against recession. Americans are now the largest visiting group to Iceland. With the lure of its dramatic scenery, the country is also aiming to capture more of the lucrative Japanese tourist business.



Cold weather market (*above*) Sheep at a livestock market in Iceland. In the 1970s and 1980s a wool industry grew up around the Icelandic herds, and agriculture developed to the extent that the island became self-sufficient in milk and meat products. However, in spite of prolonged efforts to diversify the economy, fishing remains the main export industry.

On a roll (*right*) Paper products made from wood pulp in Finland's paper mills accounted for $8.3 billion of export revenue in 1992. Forestry is the mainstay of Finland's considerable prosperity, accounting for over 65 percent of the country's land area, and generating enough wood and paper products to make up 40 percent of national exports.

1989 was only 1.6 percent in Sweden and Iceland, 3–4 percent in Finland and Norway, but more than 9 percent in Denmark. The Nordic governments funded generous public spending – which in the early 1990s accounted for half of GDP in Norway and Sweden, and a third in Denmark, Finland and Iceland – by high taxation and government borrowing.

By 1990, the worldwide recession – coupled with lower oil prices and burgeoning public sector growth in Denmark and Sweden in particular – had begun to put the region's economies under pressure. Unemployment in 1991 increased sharply to over 6 percent in Sweden and Norway, and about 13 percent in Finland. For the first time in decades the region's creditworthiness was called into question. In 1990 Swedish debts to foreign lenders totaled the equivalent of one-third of GDP. Although the deficit is lower in the rest of the region – and negligible in Denmark – it is doubtful how long government borrowing can continue to insulate the Nordic economies against world recession. As a result, traditional economic policies, with their expensive emphasis on social welfare, have come under severe scrutiny. In the early 1990s conservative governments in Finland, Norway and Sweden introduced economic reforms designed to reduce the role of the state and modify welfare provision.

Demographic trends are also beginning to alter the balance of the Nordic economies. Uniformly high life expectancy and low birthrates have resulted in rapidly aging populations. Governments will have to consider how to support their old people with customarily generous pensions on the basis of tax revenue from a shrinking labor force. Furthermore, there is a danger that industry will flee abroad in the face of the high wages that inevitably accompany labor shortages, while the use of cheap immigrant labor could threaten the social homogeneity that nourishes the traditional Nordic societies. On the other hand, the well-motivated and highly educated Scandinavian workforce may continue to attract the most advanced manufacturing and service industries, and Scandinavian companies seem fully aware of the possibility of shifting their low-wage sector into Eastern Europe through the sort of partnership arrangements that Volvo, for example, have with Renault.

WELFARE AND WELL-BEING FOR ALL

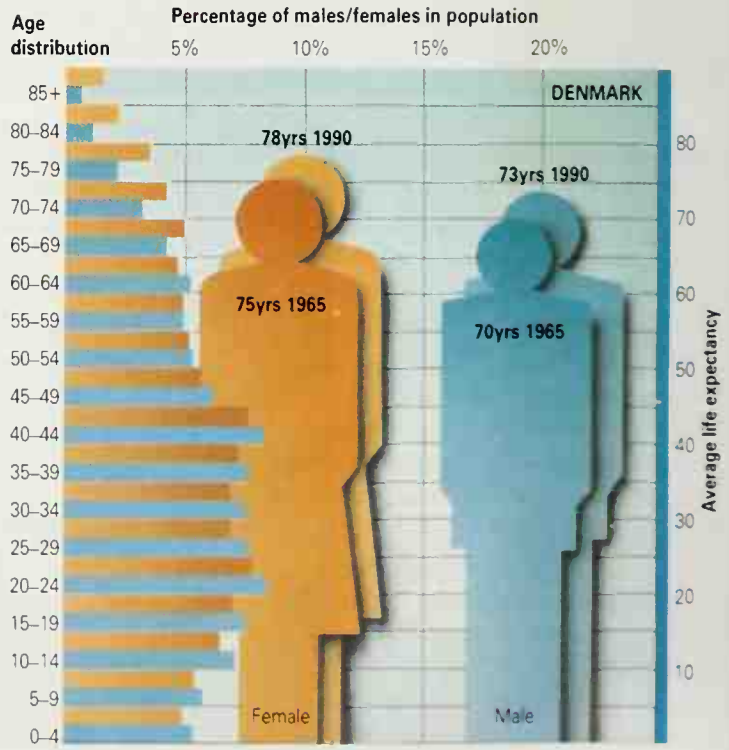
The economic success of the Nordic Countries rests upon a highly skilled workforce, and they have made a large investment in education. Most schools are state run, with the option of subsidized private schools. Where there are fees, financial assistance is available to most students. About one-third of young adults are in higher education, and a strong emphasis is placed on adult training. Free evening and daytime courses run by local authorities are available throughout Sweden; Norway has expanded its higher education facilities in order to accommodate the expected doubling of student numbers by the end of the 20th century; and Denmark has invested heavily in a folk high school for adults which has no entrance requirements or examinations, an unrestricted curriculum and a practical bias.

The national health

While beset by the same budget dilemmas as other rich countries, the healthcare systems of the Nordic Countries deliver a level of service which makes its citizens among the healthiest on earth. Denmark runs a free national health service. Norway and Sweden operate a compulsory health insurance service which reimburses the majority of fees. Family counseling is also available under Norway's plan, while Iceland offers free dental care to children aged 6–15, with 50 percent discounts for younger children and the elderly. Most hospitals are state run and the region is a world leader in

Investing in comfort (*above*) A large housing project in Copenhagen, Denmark. In a city that has one of the world's highest costs of living, the government ensures that, even in crowded conditions, housing is of a uniformly high standard.

A broad-based education (*below*) starts early for children in the Nordic Countries. Most students learn English as well as another regional language and have a solid grasp of national geography and history.



Life expectancy and age distribution (*below*) Denmark, like its neighbors Sweden and Norway, has one of the largest proportions of elderly people in the world, and one of the lowest birthrates.

GREEN ECONOMICS

The environmental movement is strong in the Nordic Countries. In 1988 Sweden met 22 percent of its need for glass from recycling and Denmark 27 percent. Although figures for Finland (3 percent) and Norway (6 percent) are significantly lower, a feeling for conservation is reflected in the growing prominence of "green" politics. In a 1980 referendum Sweden voted to phase out all its nuclear power by the year 2010. Following the Chernobyl accident, the Swedish government decided to close two reactors as early as 1995 and 1996. The cost of this plan – an estimated 5 to 10 billion kronor ($0.8–1.6 billion) for every year that the reactors are not in use – indicates Sweden's commitment to environmental safety.

Environmental protection frequently seems incompatible with economic growth. The Nordic Countries may be better prepared than most to reconcile growth with long-term conservation but there are other issues too pulling at the purse strings. Given the aging population and the consequent mushrooming of pensions paid out, welfare expenditure can only grow dramatically in the next few decades.

preventive medicine and research. During 1988 the rate of infant mortality in Sweden and Finland of 6 deaths per 1,000 live births was bettered only by Japan. Denmark and Norway with 8 deaths per 1,000 were equal with the level of the OECD countries as a whole.

Rural populations and the citizens of small remote towns have equal access to public services. Services in towns such as Umeå in northern Sweden are almost entirely the creation of regional policy; even at such a far remove from Stockholm there are not only hospitals but also theaters, universities and opera houses. The real problem is that in a time of recession, private sector jobs are withdrawn first from peripheral areas, reducing incomes of those living away from the major population centers.

Striving for equality

The Nordic Countries have a reputation for promoting legislation on equal rights for women. There is extensive provision of childcare facilities, part-time work rights for both men and women with children, maternity and paternity leave and generous amounts of annual leave. Although expensive, these provisions allow the Nordic economies to offer women the choice of combining formal careers with childrearing. Compared with the EC average proportion of women in the workforce of 40.3 percent, in Norway it is 44.5 percent, Iceland 44.9 percent, Denmark 45.8 percent, Finland 47.2 percent and Sweden 47.9 percent. However, as elsewhere in the world, women's salaries tend to be lower than men's, and rural and working-class communities remain patriarchal. Nonetheless, substantial gains have been made. In Finland, one-fifth of the judges and two-fifths of the lawyers are women. Iceland's President Vigdis Finnbogadottir, the first woman in the region to win a national popular election (1980), was also one of the first single women in Iceland to win a legal battle to become an adoptive mother.

Class differences in Nordic society are growing despite the tradition of solidarity. Differences in income levels between professionals and manual workers have always been narrow, though wider in Denmark; in 1984 a member of the Swedish cabinet earned about twice as much as a factory worker. During the 1980s living standards in Sweden and Norway rose continually due to the welfare state. However, national wage bargaining seems under threat, and the gap between the very rich (usually working for foreign companies) and the growing numbers of unemployed is growing while the ability of the state to retain its own employees and attract new ones is questioned throughout the region.

In spite of the social homogeneity of the Nordic Countries, there are still some ethnic issues. Minorities comprise a very small percentage of the population – often less than 1 percent. First, there are the Sami (or Lapp) peoples, nomadic people who follow the reindeer herds in northern Norway, Sweden and Finland. Their livelihood is threatened by commercial lumbering, mining and other development in the areas they move through. The second source of ethnic difference is immigration. The capital cities of Scandinavia have attracted not only guest workers – from Germany, Italy, Greece, and the former Yugoslavia and also from Finland in the 1960s – but also political refugees. There are substantial Latin American communities in Swedish and Danish cities. Often, despite a highly qualified educational background, the immigrants are unable to find work and find themselves socially and geographically isolated.

High taxation – high protection

Mikhail Gorbachev has said that he would like to see a Swedish-style welfare state replace state socialism in Eastern Europe. He is only the latest in a long line of commentators who have seen in Sweden a unique compromise between capitalism and socialism: an economy based on private property but with a large, redistributive state sector providing generous healthcare, education, unemployment benefits and pensions. Denmark and Norway have similar, though less generous, welfare systems.

A contract against poverty

The distinctiveness of Sweden dates from the 1930s. In response to the Great Depression the Swedish people committed themselves to full employment through state intervention in the economy. The left-wing political parties suspended the struggle for socialism in favor of an alliance with liberal and agrarian parties, ensuring support for ambitious job-creation programs. Outside Scandinavia, no such consensus was built, isolating socialists, undermining democracy and delivering the people into the horrors of mass unemployment and, in the case of Germany and Italy, fascism.

After World War II, many European countries adopted the Swedish strategy of the 1930s, now justified by the demand management philosophy of John Maynard Keynes (1883–1946). Many countries followed Sweden in rationalizing their welfare systems and removing the stigma that had previously been attached to receiving state assistance. But Sweden went further still, raising the level of benefits to about 80 percent of regular pay. This new and very generous support was accompanied by additional benefits for single parents, the disabled and families with children. The Supplementary Pensions legislation of the late 1950s gave manual workers the same pension rights as senior civil servants: a pension based on 60 percent of salary during the 15 best-paid years of work.

Supporting the system

These programs are expensive and the Swedes pay high taxes, but the system has significant ethical and economic supports. A corporatist system of national wage bargaining (over 80 percent of Swedish workers are unionized) rests on the solidarity of skilled workers and professionals with manual laborers. It has produced quite a narrow band of incomes, discouraging both the vandalism of resentment and the consumerism of the upwardly mobile. These national wage agreements allow weaker enterprises to fail and ensure large profits for successful ones, since workers in both will be on about the same wage scale. Workers paying high taxes have the security of knowing that their earnings will suffer only marginally if their ability to work is interrupted. Most of the redistribution of wealth via public assistance is across the life-cycle rather than between classes.

The incorporation of organized labor and organized management into the political process has many advantages. It promotes industrial democracy by ensuring that workers have a formal role in decision making. Counter-cyclical economic management is made possible as the state accumulates investment funds during booms and releases them during slumps, promoting stability. There is a strong incentive for all sides to maintain industrial harmony, as the costs of failure in national wage bargaining would be inconceivable.

Finally, the workforce identifies more strongly with the discipline of international competitiveness, and is less resistant to new technology than is generally the case elsewhere.

Presiding over this corporatist consensus has been the Social Democratic Party, whose failure to insulate Sweden from the world depression of the early 1990s cost it political legitimacy. A government intent on retrenchment is now cutting back some of the branches of the Swedish welfare state – ironically at a time when the collapse of the command economies in Eastern Europe is directing the eyes of the world toward the Swedish model, the middle way. As even the world's wealthiest nations, such as the United States, battle against the latest international depression, with high unemployment and the soaring costs of often inadequate healthcare programs, the Swedish welfare state continues to be very attractive.

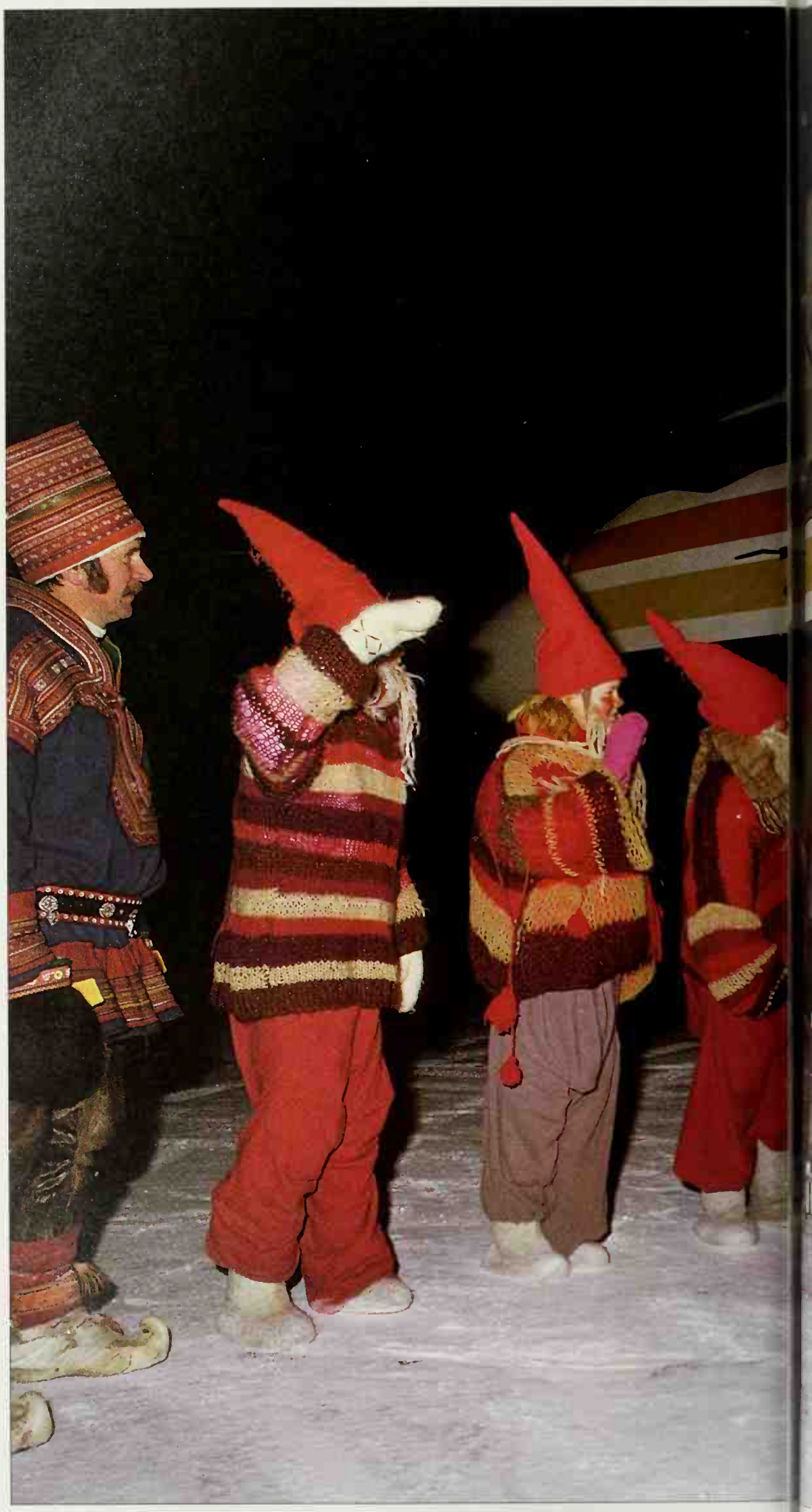
Protesting against education cuts. Swedish citizens voice their anger at a clamp down on spending that threatens their local People's High School. This is one in a network of higher education facilities established to provide free education to adults and teenagers alike.


1992
VÅR KÄRA FOLKHÖGSKOLA
KLYFTAN
STÖRRE
STENSUNDS-
FOLKHÖGSKOLA
KUNSKAP LYFTER VINGARNA BÄR U
UTBILDNING SKA GÄLLA ALLA!

Santa's package tour

Efforts are being made throughout the Nordic Countries to maximize the invisible earnings brought by foreign tourism, and Lapland is no exception to this. Package tours to visit Santa are unusual, but not unique; Lapland faces competition from sites in Norway and Denmark in offering itself up as the home of Santa Claus. Not only are the children's letters posted all over the world routed to Santa Claus in Lapland, but many children are also now visiting Santa and his helpers "at home" near the North Pole.

However, the Santa Claus industry is not just a seasonal gimmick or a godsend for the under-twelves. Santa's package tours are big business in the Nordic region and exemplify a recent shift in what we mean by industry in some developed countries. Industry does not only refer to the production of consumer goods and machine tools. Almost as important as this conventional economy of imports and exports is the culture industry and what some academics refer to as the commodification – or selling – of pleasure. Christmas is still about jingling bells, but it is also about jingling cash registers. Lapland is cashing in on this general trend.



Sick and underpriviledged children visit Santa Claus in Lapland as a special treat, paid for by charitable organizations.

PEOPLES AND CULTURES

A PIONEERING SPIRIT · CULTURAL UNITY · PROBLEMS OF AFFLUENCE

The peoples of the Nordic Countries show great uniformity in their ethnic and cultural composition, reflecting their common historical roots and the extent to which migration has taken place within the region. With the exception of Finnish and the Sami (Lapp) languages, they all speak closely related languages; Lutheranism, a division of the Protestant Christian church, is the predominant religion. The Nordic people have always possessed a great spirit of adventure, as evidenced by their Viking ancestors and more recently by the great polar explorers, Roald Amundsen (1872–1928) and Fridtjof Nansen (1861–1930). Shortage of land, which fed this restlessness, accounted for the emigration of many Scandinavians in the 19th and 20th centuries. Today affluence shapes the prevailing lifestyles of the region.

COUNTRIES IN THE REGION

Denmark, Finland, Iceland, Norway, Sweden

POPULATION

Sweden	8.5 million
Denmark	5.14 million
Finland	4.97 million
Norway	4.2 million
Iceland	253,482

LANGUAGE

Countries with one official language (Danish) Denmark; (Icelandic) Iceland; (Norwegian) Norway; (Swedish) Sweden

Country with two official languages (Finnish, Swedish) Finland

Faeroese is recognized with Danish as an official language in the Faeroe Islands

RELIGION

Denmark Protestant (95%), nonreligious and atheist (3%)

Finland Protestant (92%), nonreligious and atheist (5%), Eastern Orthodox (1%)

Iceland Protestant (96%), nonreligious and atheist (2%), Roman Catholic (1%)

Norway Protestant (98%), nonreligious (1%)

Sweden Protestant (68%), nonreligious and atheist (28%), Eastern Orthodox (1%)

A PIONEERING SPIRIT

The first inhabitants of the Nordic Countries were hunters who gradually spread northward from Central Europe when the ice sheets retreated between 10,000 and 13,000 BC. They lived primarily on reindeer and fish, and supplemented their diet with aurochs and moose. During Neolithic times, from 3000 to 1500 BC, agriculture and animal husbandry were introduced into southern Scandinavia.

Between 1500 BC and 500 BC Finnish peoples, originally from the Urals, moved into what is now southeastern Finland. The origins of the Sami (Lapps) of Finland, northern Norway and Sweden are obscure, but they appear to have inhabited those areas (and parts of the Soviet Union) for at least 2,000 years. Like the Finns, their languages belong to the Uralic family of languages. There is considerable evidence to indicate that the climate of the region worsened about 500 BC, putting pressure on the human population. The scarcity of archaeological remains suggests that numbers dropped, and the people that stayed moved their livestock into permanent shelters to help withstand the harsh winters.

The Vikings

The ending of these inhospitable conditions coincided with the Viking age (800–1050 AD) – a term that covers the period of intense seafaring activity when adventurers and raiders from Denmark, Sweden and Norway (commonly called Vikings or Norsemen) sailed their narrow ships along the coasts of Europe, raiding as far south as the Mediterranean. In the east they followed the rivers of Europe to penetrate into the heart of Russia, and they had sailed west to settle the Faeroe Islands (still belonging to Denmark today) and Iceland by the 9th century. From here colonies were established in Greenland, and even attempted in North America.

The Viking age brought tremendous change to the Nordic Countries. Christianity, which has since remained the dominant religion in the region, was introduced by the French missionary, Ansgar (801–865), first to Denmark and then to Sweden. At the same time, the earliest divisions in the common Scandinavian language – known as "the Danish tongue" – began to appear. The languages spoken in Norway, Sweden, Denmark and Iceland today all belong to the Germanic branch of the Indo-European language family. They slowly developed into distinct languages during the early medieval period as separate national identities began to take shape and became established among the Scandinavian peoples of the region.

By the mid 13th century there were Norse-speakers in present-day Norway and Iceland, Swedish-speakers in both Sweden and the colonized parts of Finland, and Danish-speakers in Denmark and parts of southern Sweden, as well as northern Germany. Subsequently, Norse split into two separate languages – Icelandic and Norwegian. As the Norwegians came under Danish domination for several centuries, their languages grew closer again. Consequently, Danes, Norwegians and Swedes are still able to understand each other fairly easily, whereas Icelanders – and to some extent Faeroese – whose languages have remained closer to their medieval roots, are unintelligible to other Scandinavians.

Between the 16th and 19th centuries, during the period of Norwegian rule from Denmark, Danish became the official written language in Norway. However, over the years Norwegian words were absorbed into this written language to produce a form known as Bokmål. In the mid 19th century a language called Nynorsk (New Norse) was created, which drew on the dialects still spoken in rural areas of western Norway, in an attempt to carry on the tradition of Old Norse. In 1907, following Norway's independence from Denmark, both types of Norse were accepted as national languages. Today Bokmål is taught to about four-fifths of Norwegian schoolchildren; the remainder – the majority of whom live in rural areas – learn Nynorsk.

A tradition of migration

There has always been considerable movement of peoples both within the region, as well as to and from it. During the 19th and early 20th centuries the twin pressures of population growth and the worsening economic conditions encouraged those brave enough to do so to emigrate, principally to the United States, Canada, Argentina and Australia: there are today more Norwegian-Americans than there are Norwegians. Scandinavian emigrants frequently settled in distinct communities in their new countries

Winter wonderland A Swedish family enjoys the thrills of cross-country skiing. This sport, which is increasing in popularity in the Nordic Countries, originated in the region as a practical means of traveling from place to place during the winter months across snow-covered, hilly terrain

and married within them, thereby establishing the Scandinavian languages and traditions overseas, as well as keeping alive a sense of national feeling toward their country of origin. For example, even today about 67 percent of the population of Solvang, a town in California, USA, founded in 1910 by Danish immigrants, remain fluent Danish speakers.

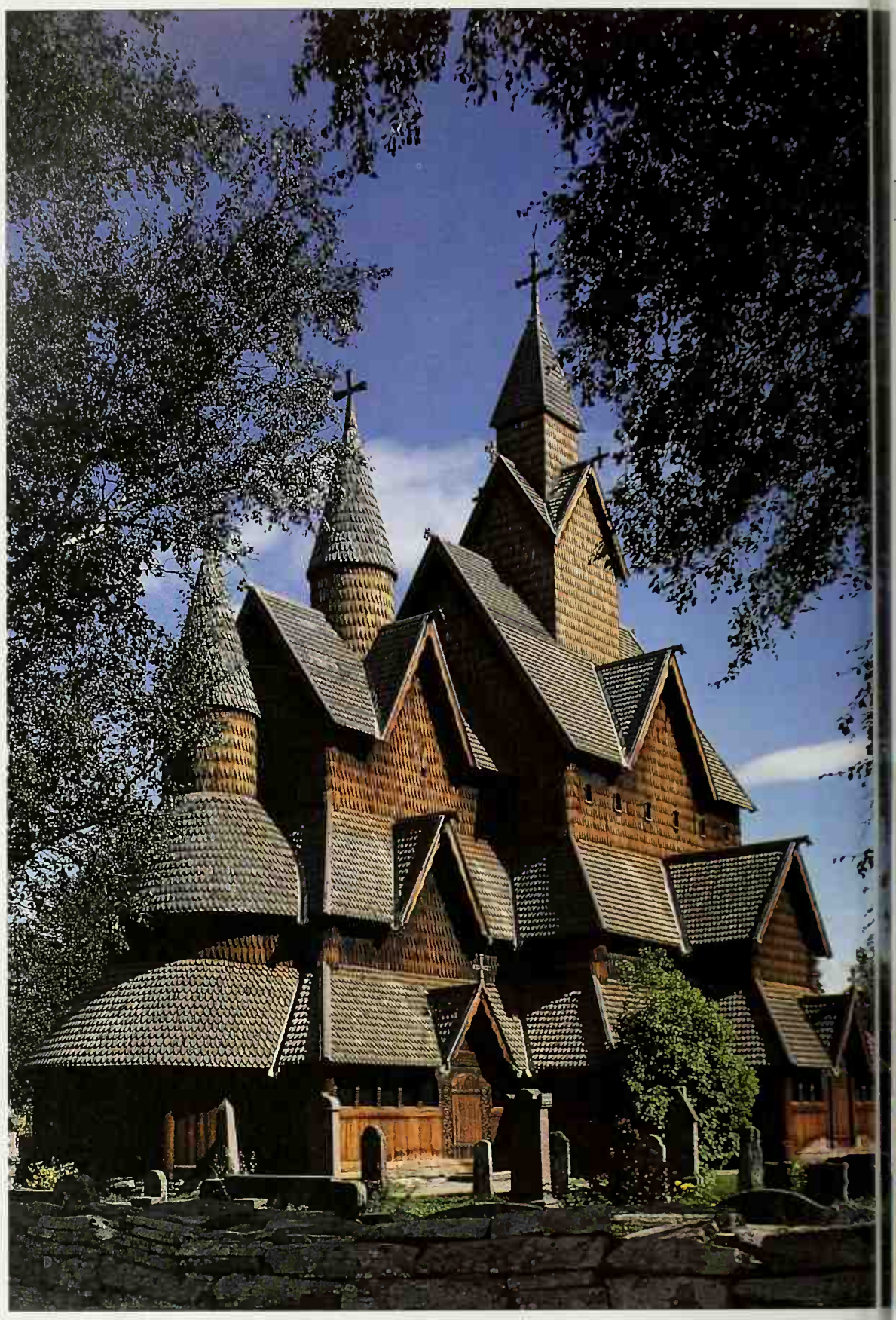
Over the centuries there has been a considerable influx of people from other European countries, such as Scotland and Germany, into the region. In the second half of the 20th century there have been increasing numbers immigrating from Asia, and the Nordic Countries gained a reputation for receiving political refugees from all over the world, but especially the Middle East. These newcomers tended to settle in their own distinct communities on the outskirts of towns and cities; the only future for many refugees is as social welfare clients in the small communities to which they have been sent. In the late 1980s the former consensus on immigration and refugee policy came under increasing pressure from populist political parties in Sweden, Norway and Denmark – the Swedish government, for example, refused entry to 5,000 Bulgarian Turks in 1989, in response to public outcry – despite the comparatively low numbers of immigrants in all three countries.

CULTURAL UNITY

The four major Scandinavian languages of the region (Danish, Norwegian, Swedish and Icelandic) have played a central role in shaping and preserving the national identities of the respective countries in which they evolved, and today are spoken by more than 90 percent of their populations. None has acquired regional dominance, so English is the universal secondary language. It is taught in schools from the age of 10, and is frequently used when communication between speakers of different Scandinavian languages fails. German is spoken by some 20,000 people in Denmark living just north of the border with Germany. The Danish government provides separate schools for this minority group.

Only in Finland is there significant linguistic diversity. For a long period of its history (between the 14th and the 18th centuries) Finland formed part of the territory of Sweden. During this time all official business was conducted in Swedish, which was also the language of literature. Today Swedish is spoken by some 6 percent of the population of 5 million, and it is recognized with Finnish as being an official language. Even after Finland was ceded to Russia in 1809, Finnish had no official status – it did not achieve this until 1863. During the 19th century the language played a vital part in fostering Finnish nationalist aspirations, particularly with the publication in 1835 of the *Kalevala*, an epic poem based on themes from Finnish folklore.

In the north of the region three distinct forms of Sami, or Lapp, related to Finnish, are spoken. However, nearly all the 40,000 Sami of Norway, Sweden and Finland are now bilingual, speaking as their second language the official language of the country in which they live, and many no longer speak their native language at all. In the face of this evidence of cultural assimilation, the Sami continue to assert their right to remain an ethnic minority inside the Nordic nation-states, and recent struggles have consequently centered on the campaign to teach the Sami languages in schools.



A stave church at Heddal in Norway, built in 1250. These wooden medieval churches sprung up all over Norway with the spread of Christianity. The boxlike frame is built around a number of "masts", each supporting up to six tiers of double-sloped roofs.

Religious consensus

By and large, the Nordic Countries are culturally homogeneous and minorities of any kind are rare. One of the ties that links the peoples of the region together – apart from the bonds of a shared history – is a common religion. More than 90 percent of the population are members of the Lutheran church – the oldest and the largest of the Protestant Christian churches. This follows the teachings of Martin Luther (1483–1546), a monk from Germany who spoke out against the influence and corruption of the medieval Roman Catholic clergy.

Lutheranism spread quickly from Germany to the Nordic Countries in the 16th century, and was established by law in each of them as the state religion, thereby avoiding the bitterness of religious controversy that divided the rest of northern Europe in the 17th century. The intervention of the Swedish king, Gustav II (1594–1632) – better known as Gustavus Adolphus – on behalf of the Protestant cause during the Thirty Years' War (1618–48) in Germany was a powerful factor in ensuring its survival against Roman Catholic hostility.

THE LANGUAGE OF THE SAGAS

Norwegian Vikings first reached the uninhabited island they called Iceland late in the 9th century – tradition says that they were fleeing the tyranny of King Harald Fairhair (c.860–940), the first king to claim sovereignty over the whole of Norway – and by 930 some 40,000 people had settled there. The Icelandic sagas, written mostly in the 12th century, record the first 100 years of the Norse settlement in Iceland, starting with the establishment in 930 of the *Althing*, said to be the world's oldest parliament.

The sagas recount in detail the expeditions, family feuds and legal disputes of these island people, and in so doing provide a unique record of a changing society: because of this they find a place in the literature of the world. Even more important in cultural terms, however, is the role the sagas played in defining and preserving the Icelanders' identity and heritage over the centuries of their political domination, first by Norway, from 1264 to 1380, and then by Denmark until 1944.

During these years the Icelandic language remained very stable – not even Danish has had any major influence on it – so the language spoken today is very close to that of the sagas. Loan words are rare, and are only accepted if they can be both grammatically and phonetically adapted to the Icelandic language. An old Norse peculiarity preserved in the Icelandic language is that family names are not commonly used. Instead *son* (son) or *dottir* (daughter) is added after the father's forename. The name Einarsdottir, then, simply means the daughter of Einar.

The clean bare look of Scandinavian interior design had a huge influence on the rest of Europe during the 1960s. Floors and furniture are in natural wood against a pale background, and fabrics are woven in neutral colors decorated with traditional motifs.

Lutheranism remains the official religion in each of the Nordic Countries, and religious practice is strong by comparison with other European countries. A number of religious sects – Mormons, Pentecostalists and Jehovah's Witnesses – exist in small, isolated communities. As a result of immigration from outside the region some cities contain groups of Muslims, Hindus and Buddhists.

A rich cultural tradition

Although in the past, they were isolated to some extent from the mainstream of European artistic and cultural activity by distance and language, each of these small countries has nevertheless produced major figures of worldwide significance in a number of different fields. In philosophy, the controversial ideas of the Dane Søren Kierkegaard (1813–55) have influenced many later thinkers; in art, the Norwegian painter Edvard Munch (1863–1944) was one of the forerunners of the Expressionist movement; in literature, the many plays of the Norwegian dramatist Henrik Ibsen (1828–1906), such as *Peer Gynt*, *A Doll's House*, and *Hedda Gabler*, revolutionized European theater, and those of his Swedish contemporary August Strindberg (1849–1912) also achieved world fame. The stories of the Danish writer Hans Christian Andersen (1805–75) have enchanted generations of children.

However, perhaps the greatest achievement in the arts has been in music. Both the Norwegian composer Edvard Grieg (1843–1907) and the Dane Carl Nielsen (1865–1931) found the inspiration for their symphonic compositions and songs in the landscape and folk music of their native countries. In Finland the music of Jean Sibelius (1865–1957) has come to symbolize the nationalist aspirations of his countrymen and even Finnish nationhood itself. He drew particular inspiration from the myths of the *Kalevala*.

The development of Finland's distinctive 20th-century school of architecture also found its inspiration in the nationalist movement and the need to create a style completely independent of Russian influences. Foremost among its members were Eliel Saarinen (1873–1950), who designed the National Museum and the Helsinki railway station, and Alvar Aalto (1898–1976), architect of the Finlandia Hall in Helsinki.

Folk art motifs and traditional handicrafts have been a major influence on the development of contemporary textile, furniture, ceramic and glass designs. The Nordic Countries have become particularly well known for these designs in the 20th century, and many are exported around the world. In spite of this, traditional crafts have disappeared in many urban parts of the region; they have been preserved longest in remote rural areas such as western and northern Norway. Books and magazines, as well as television, play a major role in spreading popular culture – Norway, for example, publishes more books per capita than almost any other country in the world.

Among young people, rock music festivals are becoming increasingly popular. Large open-air concerts, lasting several days, are held throughout Scandinavia every summer, and are likely to attract audiences of more than 100,000 people. Internationally known Western rock bands and also, increasingly, bands from Eastern Europe are regular performers at these events.

PROBLEMS OF AFFLUENCE

Unlike many of their European counterparts, most people in the Nordic Countries have retained close links with their rural origins, even though the majority now live and work in towns and cities. Part of the appeal of the unspoilt natural areas of the countryside lies in the escape route it gives from an all-encompassing social system.

In material terms, the Nordic Countries are extremely affluent. They are often represented as model examples of the 20th-century welfare state, and few countries have succeeded in creating such elaborate social security systems for all their citizens. From nursery education and disability allowances to old people's homes and the free use of hospitals, a wide range of services is provided. Unemployment benefit is superior to that found in most other countries; basic education is free and young people are able to obtain higher education by combining state grants with loans from banks or the state.

The negative side to such superb benefits is that it may encourage some people to drop out of society, turning instead to the drug culture or "alternative" lifestyles, while others find their escape by going in search of the simple life. Modern technology makes "going back to nature" a relatively relaxed and comfortable business. Transportation is readily available, food is assured, and medical services are rarely far away.

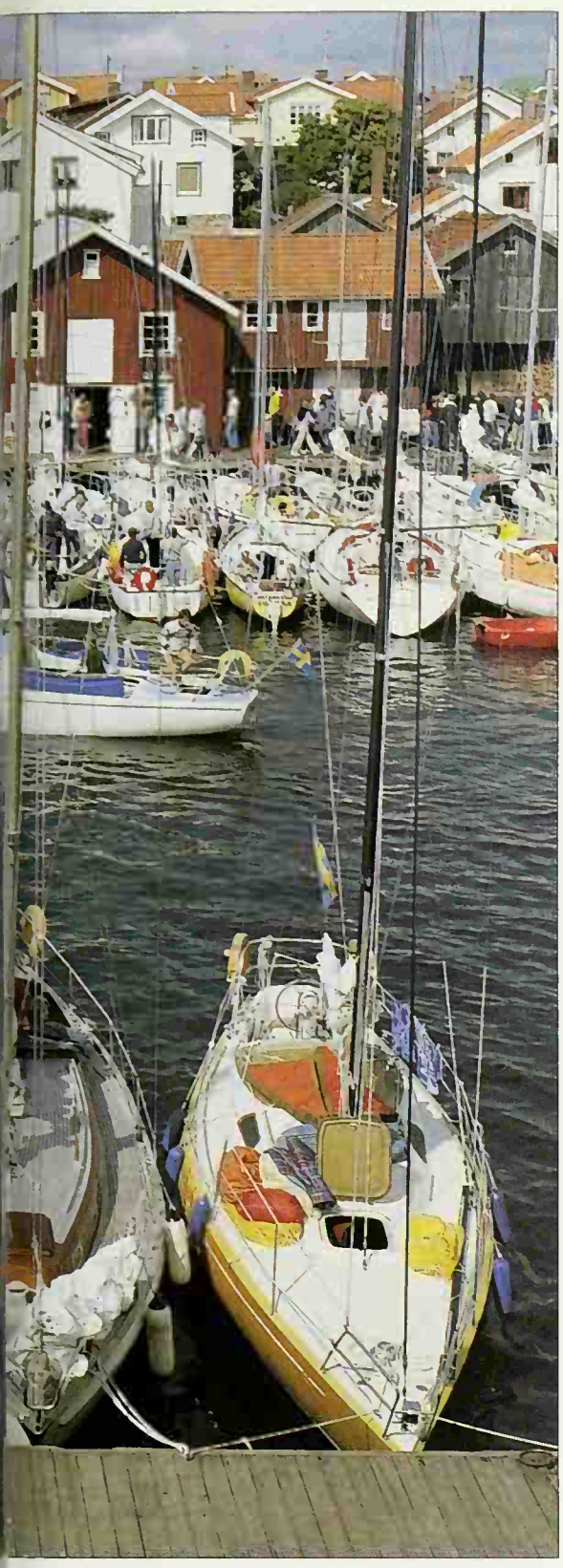
Leisure-time cultures

At weekends, many people retreat to their country cabins in the mountains, by the coast or in the forest. These cabins vary from the most simple, with little insulation, to those boasting modern facilities such as washing machines and double glazing. The renting of country cabins is also widespread, so the number using them for rural retreats is even greater than the quantity of cabins suggests. They are frequently let to foreigners, especially Germans: in summer parts of the west coast of Jutland in Denmark are crowded with German visitors, and German is the most frequently heard language in shops and restaurants.

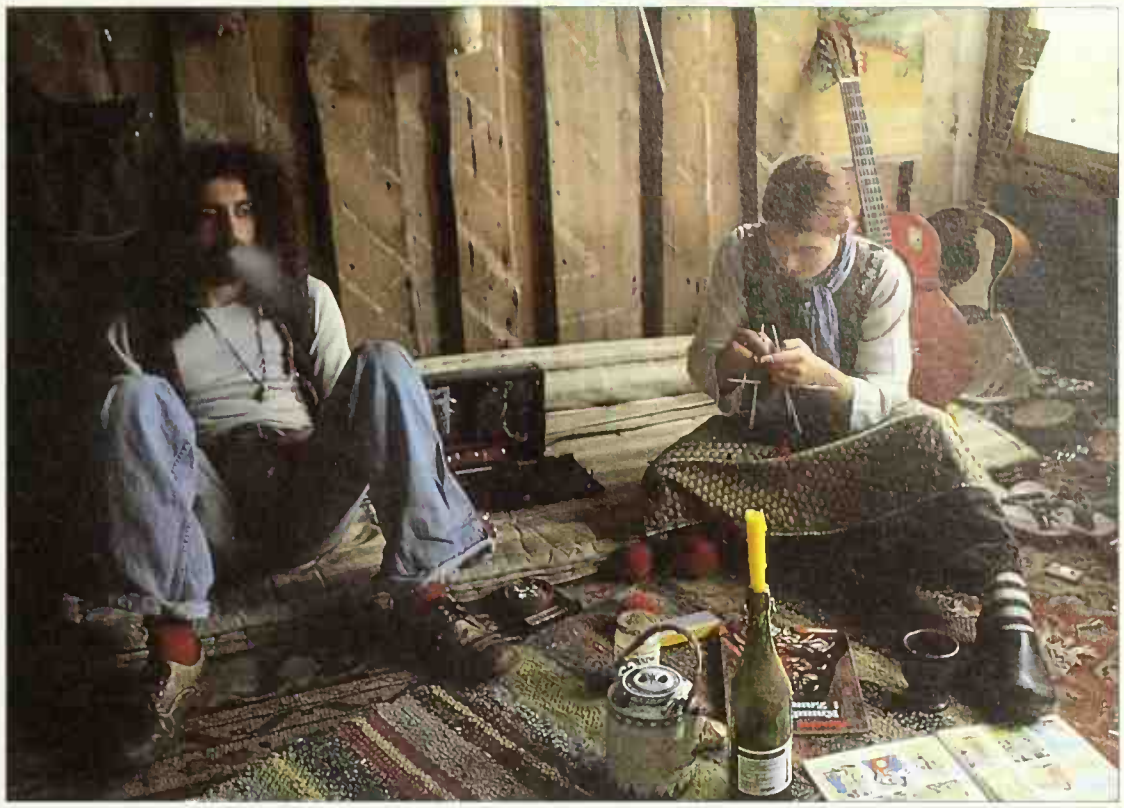
Membership of a sports club is a vital part of most Scandinavians' daily lives; it provides them with physical exercise as well as a focal point for social and cultural contacts. Every year Nordic championships in a variety of sports such as weightlifting, athletics, speedway racing, swimming, and billiards are held in one or other of the countries in the region, and these attract a large number of participants. Soccer, too, is popular both as a participatory and a spectator sport. Those living near the mountains in Norway and Sweden enjoy regular skiing in winter and even, in some places, in summer. Crosscountry skiing is popular on the more level surfaces of Finland and southern Sweden.

The increased use of the countryside for recreation and escape from the varied demands of everyday life has put Nordic governments under pressure from their voters. During the 20th century nature has been culturally redefined. Instead of being pure wilderness, the countryside is now perceived as an essential part of Nordic leisuretime pursuits. It is regarded as a heritage that should be protected in its own right, even at the expense of shortterm profit.

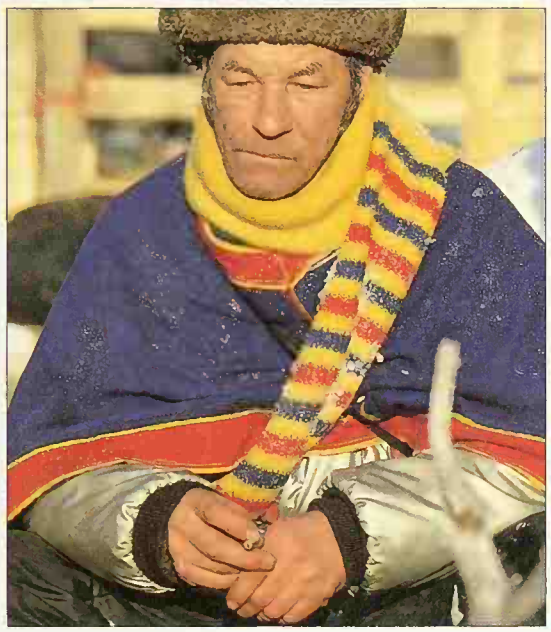
Perhaps the most visible sign of this new attitude to nature is the establishment of the region's large national parks, whose environment and uses are protected by state legislation. Although certain activities, such as the use of automobiles and the lighting of open fires, are banned, camping is permitted – indeed, in Norway and Sweden it is legal



The pleasures of affluence Many people in the Nordic Countries now enjoy sailing as a leisure activity rather than the means of survival it was in the past. Most of these buildings along the waterfront are holiday homes, often rented to other families and foreign tourists.



A relic from the early 1970s (*above*), this alternative lifestyle commune was set up in a former barracks in Copenhagen, Denmark. Some 20 years on, the authorities felt that its time had passed and proposed in 1991 that it be turned into a children's playground



A Sami reindeer herder (*above*) in northern Finland Over modern weatherproofed clothing he is wearing a traditional cape in the bright colors that are typical of Sami dress. The unique Sami culture and languages are under increasing threat.

pitch a tent anywhere except on cultivated land and close to private houses.

Rise of the mass media

The mass media play an increasingly important part in the lives of most Nordic people. During the 1970s, for example, the average Finn devoted nearly five hours a day to the mass media, mainly watching television and listening to the radio. In the 1990s, with the advent of satellite and cable broadcasting, there is a greater choice of programs, including many from the United States. Cable television in Denmark offers its viewers 18 channels to choose from.

Despite frequently expressed fears that the popular success of this international multimedia culture will suppress the indigenous cultures of the individual countries in the region, such effects are difficult to measure. However, there is evidence to show that in Finland, far from bringing about a decline in interest in the traditional arts, they are now enjoying greater popularity than ever.

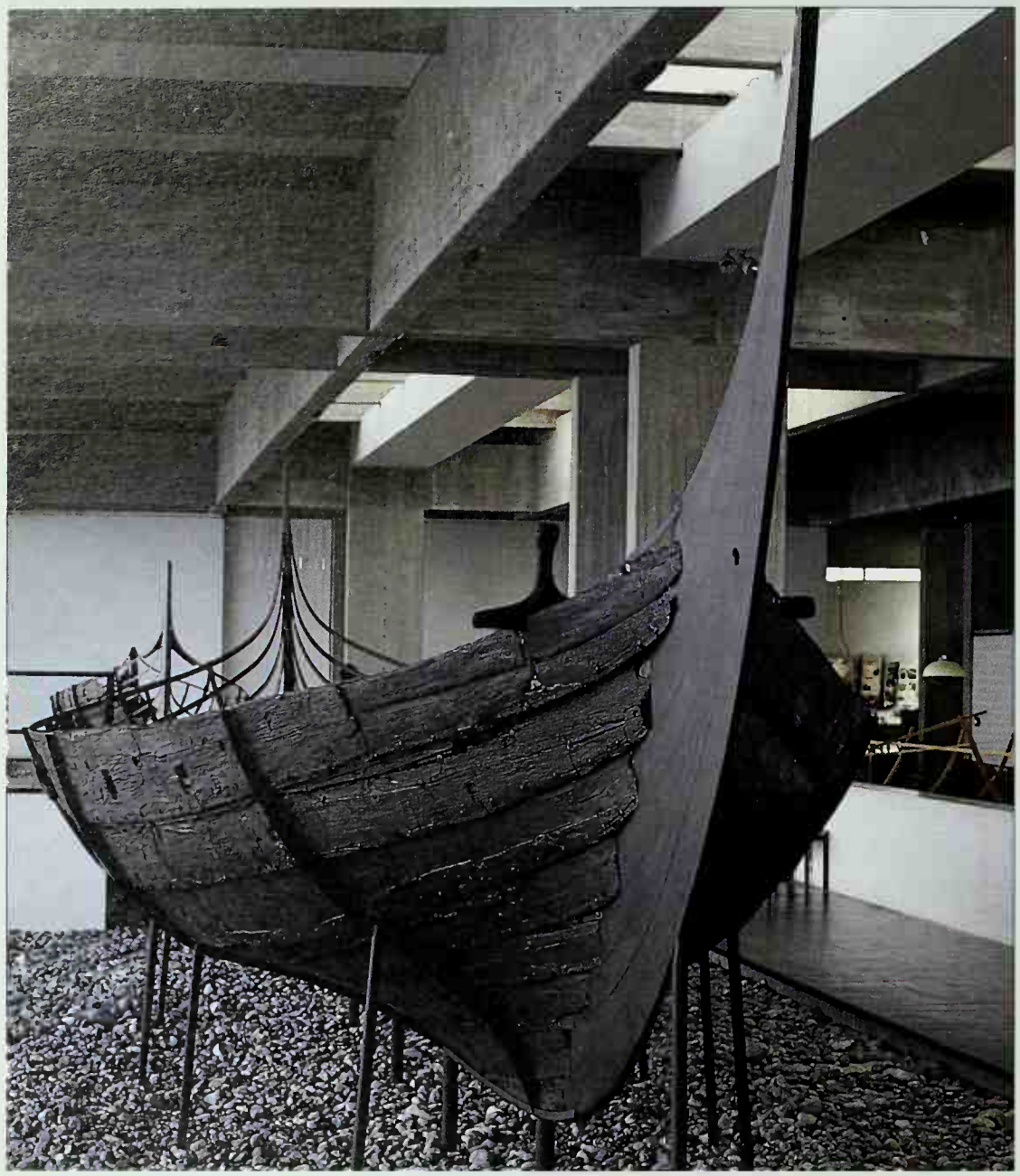
SAMI SURVIVAL

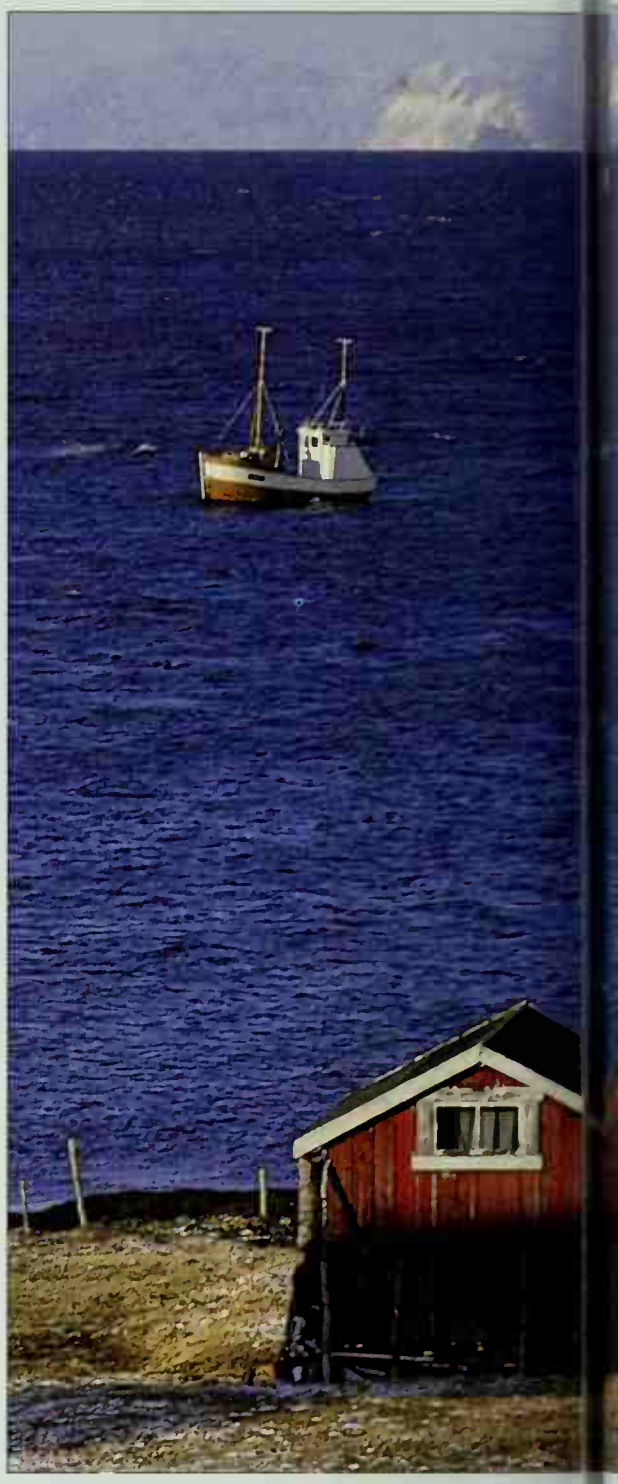
Many of the Sami, or Lapps, living in scattered groups in the far north of the region, have become thoroughly assimilated within the prevailing culture of the region. This is particularly true of those living in Norway, where their numbers are greatest. Yet the Sami possess a strong sense of their separate ethnic identity, and this has fostered the determination to preserve their traditions and language against further erosion by modernizing pressures. Today the Sami face the dilemma of having to find a means of economic survival that will enable them to remain as they are, without turning them into living museum exhibits or forcing them to live in reservations.

For more than 300 years the Sami have supported themselves by herding reindeer – a way of life they turned to from a hunting–gathering existence when their natural food supply began to be depleted through overhunting. Today, however, reindeer husbandry is no longer viable, except for a very few, and many have turned instead to farming and fishing.

Yet much of their traditional culture is closely linked to this nomadic way of life, and many Sami are quick to defend their historical grazing and migratory rights – along with their language and traditional forms of dress – as a way of ensuring their cultural survival. Sami ethnic consciousness transcends national boundaries, and in recent years Sami living in the Soviet Union have begun to attend reunions in Scandinavia.This would have been impossible a few years ago, when the Soviet–Finnish and Soviet–Norwegian borders were firmly closed to the Sami.

Fishing traditions





This Viking longship, preserved in the Roskilde Museum, Denmark, is typical of those used by colonizing warriors; it is 1,000 years old and probably held about 80 men. The sleek shape of its high prow is still common on fishing vessels in use today

For millennia, the sea has provided the people of the Scandinavian peninsula and islands with an easy means of communication along the coast with other parts of the region and beyond it, and a ready source of food. Fishing has been a reliable and constant resource, providing a basis for exchange: in the Middle Ages, traders from the Hanseatic ports of the Baltic traveled annually to the northernmost part of Norway to exchange grain, rope and luxury goods for furs and dried fish. Both commodities were greatly in demand among the people of central Europe – the first as an item of dress that conferred status upon the wearer, the second as a food that could be consumed on fast days when the Roman Catholic church forbade the eating of meat.

Different local conditions have given rise to a variety of fishing techniques within the region, though most traditional fishermen rely on nets and long lines. The calm waters of the Swedish and Finnish archipelagos and of the Danish and Norwegian fiords are particularly suited to small, open fishing boats, and here the traditional Faeroese boat excels. This elegant, seaworthy vessel closely resembles the Viking ships of the past, being slender and tapered at both ends with a high bow and stern. Traditionally, the boats were owned by the more prosperous fishermen themselves, and any additional crew members were paid from a shareout of the catch at the end of a fishing trip. Few fishermen could afford to depend solely on the sea to provide them with their livelihood.

Although women rarely participated in fishing expeditions, they played an important role in the fishing communities strung out along the Scandinavian coastline. Often assisted by their children, they would mend the fishing nets, bait the long fishing lines, and dry the fish for marketing. The development of modern technology in the fishing industry means that these activities are now carried out by machinery, but many women work instead in local fish processing plants.

A fisherman's "luck"

Although the prevailing calm conditions of the Scandinavian coastal waters make inshore fishing a relatively safe business, storms may suddenly occur without any warning. Over the generations, many

Northern waters A fishing trawler from Tromsø, in the far north of Norway, recalls the Nordic peoples' long links with the sea. Fishing communities are strung out along the length of Norway's rugged, indented coastline.

families have lost fathers, husbands and brothers to the sea. The unpredictable nature of fishing has inspired a variety of beliefs and legends among the fishing communities, which enjoyed currency well into the 20th century.

In the Faeroe Islands, for example, it was believed that if a seal appeared in front of a boat it was a sign of misfortune, but if it appeared behind the boat it was an omen of good luck. Likewise, certain women signified misfortune. Should a fisherman meet a red-haired woman on the way to his fishing boat, he would be well advised to stay at home. Similar advice would apply if he met a woman carrying ashes from the fireplace.

It was also believed by the Faeroese that a boat's future could be foretold by the boat builder if he took a curly wood shaving from the boat and threw it on the floor. Should the shaving on landing resemble the shape of a small boat, then the omens were favorable. It was held to spell bad luck if a new boat was to touch the ground on being launched for the first time – a boat that did so was destined to run aground. To avoid such misfortune, elaborate precautions were taken to safeguard the passage of the boat from the building yard to the water.

Particular ceremonies, such as the ritualistic rubbing of fishing boats with seaweed to symbolize their partnership with the sea, were observed at the start of each fishing season. Today, with the development of sophisticated fishing technology, almost all these fishing traditions have disappeared, and many of the small fishing communities themselves are likely to become a thing of the past, their way of life ended by the fleets of industrial trawlers, owned by large companies. With their huge catches, commercial fleets have depleted the fish stocks of the North Atlantic, making it harder and harder for individual fishing boats to make a living from the sea.

Environmentalist organizations such as Greenpeace, which seek to restrict the size of catches, are also a source of friction. In particular, many fishermen in the Faeroes and Norway see the international ban on whaling as a direct threat to their livelihood. For generations whaling has been a mainstay of their fishing communities and many fear they will be unable to survive without it.

CITIES

THE EVOLVING SETTLEMENT PATTERN · REGIONAL URBAN STRATEGIES · CITIES IN A GREEN ENVIRONMENT

The settlement pattern of the Nordic Countries has been, and still is, strongly influenced by their mountainous terrain, forested interiors and hostile climate, restricting occupation to the coasts. For centuries fishing, farming and forestry were the predominant ways of life, and settlements remained small and widely dispersed – only in Denmark did a dense network of villages develop. Industrial growth and the construction of roads and railroads in the 19th century changed this pattern as people began to move from the countryside to the expanding towns. Today most people live in the cities, where they enjoy a high standard of living. Urban environments are pleasant and carefully planned, with plentiful provision of green spaces, efficient transportation systems and good housing.

THE EVOLVING SETTLEMENT PATTERN

Archaeological evidence suggests that the earliest settlement in the region was in Denmark, where widely scattered hilltop burial mounds reflect a relatively dense prehistoric population. The way in which it spread over the last 1,500 years can be detected from place-name evidence. Early settlement in all of the Nordic Countries was based on fishing in the inshore waters and farming the fertile clay soils of the coastal tracts. Fuel and materials for building were abundant in the wooded hinterlands and iron deposits were present in peat bogs and lakes. The mountainous terrain of Norway and the forested interiors of Sweden and Finland

Map of population density (*below*) Most people in the region live in coastal settlements in the south where climate and terrain are most favorable – few live above the Arctic Circle. Denmark is the most densely populated country.

COUNTRIES IN THE REGION

Denmark, Finland, Iceland, Norway, Sweden

POPULATION

Total population of region (millions)	22.9
Population density (persons per sq km)	20 8
Population change (average annual percent 1960–1990)	
Urban	+0.9
Rural	−1 6

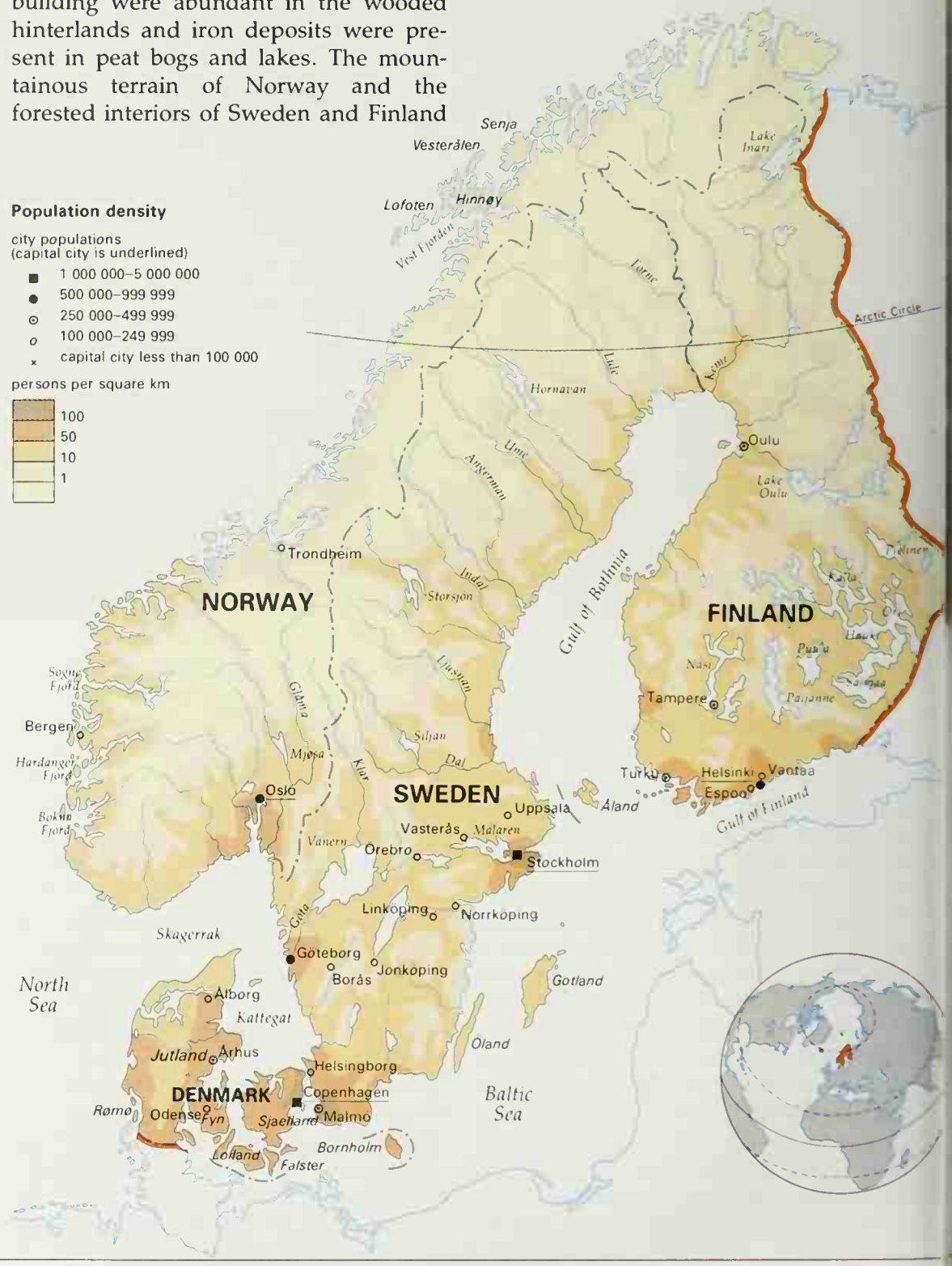
URBAN POPULATION

As percentage of total population	
1960	72.3
1990	82 6
Percentage in cities of more than 1 million	12.1

TEN LARGEST CITIES

	Country	Population
Stockholm †	Sweden	1,471,000
Copenhagen †	Denmark	1,339,000
Helsinki †	Finland	994,000
Oslo †	Norway	726,000
Göteborg	Sweden	720,000
Malmö	Sweden	466,000
Turku	Finland	265,000
Tampere	Finland	261,000
Århus	Denmark	258,000
Bergen	Norway	211,000

† *denotes capital city*



Fire and water (*above*) Ålesund in Norway has been a fishing community for centuries. In a region where houses were traditionally built of wood, fire has always been a danger. Ålesund, destroyed in 1904, was later rebuilt in granite.

discouraged early occupation, and communication through these areas was difficult. Waterfalls and rapids prevented travel along the extensive river systems that drain the great lakes of Norway, Sweden and Finland.

The Nordic Countries, except for Denmark, lay outside the feudal system that so influenced the evolution of rural communities elsewhere in Europe. Farmers were independent, owning their own land. Farmsteads, consisting of a cluster of farm buildings, often occupied by an extended family, were widely dispersed across the countryside rather than concentrated in villages. Iceland, colonized in the 10th century from Norway, is unique in that the Book of Settlement (*Landnama bok*) records the names of the original farmsteads and their occupants.

The exception to this pattern was Denmark. Here the open-field system of landholding prevailed, with the farming population living in compact villages and cultivating the surrounding land. It only came to an end in the 18th century. Also at this time, new methods of reclaiming land, introduced from Germany, encouraged the colonization of heathland on the Jutland peninsula and the establishment of planned villages.

The growth of urbanization

During the medieval period urban centers began to develop throughout the region, usually around an important church or religious center, or around a military stronghold. Wherever concentrations of people formed, tradespeople and merchants were attracted to supply their needs and so market towns grew up. Trondheim on Norway's western coast (whose shrine to St Olaf made it a major pilgrimage center), Lund in Sweden, Ribe in south Denmark and Turku on the southwest coast of Finland are examples of towns that developed around a cathedral. Kalmar in Sweden and Elsinore in Denmark were originally castle towns.

A further stimulus to urban growth came with the emergence of the region's distinct nation-states and the rise of capital cities. Usually this became each country's single dominant urban center. Copenhagen, already a center of commerce, grew as one of Europe's great cities in the 17th century through its development as a military and naval base

Out-of-town tranquility (*below*) Alone among its neighbors, Denmark's settlement pattern includes a network of villages. Some such as Dragor, located on Amager Island southeast of Copenhagen, serve today as dormitory suburbs.

The city mosaic (*right*) This bird's-eye view of Copenhagen shows a variety of housing styles dating from different periods of time. Huge courtyard apartment blocks mix with older gable-roofed houses and with modern glass and concrete constructions.

serving the Danish state. Stockholm also blossomed as the capital of Sweden, with a highly organized military structure and a virtual monopoly of the Baltic's exports of pitch, tar, iron and steel.

However, Norway's geography proved an obstacle to a similar process of centralization. As a result, three important cities evolved, each dominating its own particular area – the cathedral city of Trondheim, Bergen in the southwest, and Oslo, the capital, in the south. Turku was the leading town in Finland until the early 19th century when Helsinki, to the east, replaced it.

The single greatest influence on the growth of towns and cities in the 19th century was industrialization. The railroad network and modern steamships linked the new industrial centers that grew up around ports and vastly increased the mobility of the workforce. Old urban centers expanded and new ones came into being: wood-processing ports in Finland, Norway and northern Sweden, cement-producing towns in Denmark, mining towns in Sweden. New ports were established to deal with specialized exports – Esbjerg in Denmark for bacon and dairy products, Narvik in northern Norway for iron ore, and Hangö in southern Finland for winter trading. In recent years Stavanger in southwest Norway has been transformed by the discovery of North Sea oil and gas.

REGIONAL URBAN STRATEGIES

Migration from scattered rural farming communities to urban areas proceeded at different rates in the five Nordic Countries. In Denmark, Norway and Sweden the movement of people began on a large scale during the 19th century; Finland and Iceland lagged behind until after World War II. Today, urban-dwellers are in a majority throughout the region – Reykjavik, for example, contains about half the population of Iceland. Although the capital cities of the other countries have no real rivals for size, they all contain other significant regional centers. Göteborg, Sweden's chief port and a major industrial center, dominates the west coast and Malmö the south. In Denmark, Aarhus acts as the "capital" of the Jutland peninsula. Trondheim and Bergen compete for the status of second city in Norway, as do Turku and Tampere in Finland.

In order to reduce the population drift to the cities of the south, development of growth centers in the north has been actively promoted by the Norwegian, Swedish and Finnish governments. Target areas have been Umea and Luleå in Sweden, and Oulu and Vaasa in Finland – all ports in the northern Gulf of Bothnia. Government policies to support industrial investment and so create employment opportunities have given rise to the iron and steel complexes at Mo i Rana in Norway, Lulea in Sweden, and Rautarukki and Torniö in Finland.

The decline of rural life

Outside the cities, many people in Norway, Sweden, Finland and Iceland live neither in towns nor villages, but in dispersed settlements of several hundred inhabitants known as local service units, or *tätorter*. In remoter areas, many of these settlements have suffered from a decline in population. Younger people move to the cities, leaving a disproportionate number of elderly residents. Some *tätorter*, for example those maintaining isolated hydroelectricity stations, have small but highly skilled populations.

The provision of services for *tätorter* becomes increasingly difficult as their

FROZEN SEAS, RISING LAND

The Gulf of Bothnia, the northern arm of the Baltic Sea running between Sweden and Finland, is covered by ice for long periods each year, closing ports in the south for several weeks and in the north for as much as six months. In the past, this severe restriction on trade and communications had adverse effects on the life of towns such as Oulu or Vaasa on the coast of Finland, and Luleå or Skelleftea on the coast of Sweden. In recent years, however, ice-breakers have done much to reduce the problem. In theory they could keep every port open in all but the severest winters, but in practice this service would be too costly to maintain. A railroad network linking the ports enables goods to be transported from factories to the nearest open harbor during the winter period.

The winter freeze is not the only problem affecting these coastal settlements. All along the coast the land is rising from the sea at rates that vary from some 20 cm (8 in) per century in the south to 80 cm (30 in) per century in the center. This has been steadily taking place since the ending of the last ice age 10,000 years ago, caused by the removal of the tremendous weight of the ice sheets. It frequently leads to legal difficulties over land ownership, as well as leaving harbors and fishing quays stranded above the waterline. In the Vaasa archipelago in Finland, the sites of as many as three successive fishing harbors can be seen.

populations dwindle. Banks, cooperative stores, health centers and post offices have been closed, and their functions concentrated in the nearest town, or replaced by mobile services. Centralization of specialized health services has been particularly pronounced, with new major hospitals being established at the large university medical schools. Mobile medical and dental teams can meet normal needs, but emergencies may require helicopter ambulances to get the patient to the nearest hospital.

In thinly peopled areas, education also raises problems. Although local facilities for primary education exist, secondary education demands special provisions, with fleets of buses carrying children long distances to school. In northern Norway there are state-run boarding schools for children living in remote areas, and in Iceland, where secondary education is largely concentrated in the capital, air services may be used to ferry pupils home at the weekend.

Transport lifelines

Where territories are so extended, the provision of efficient transportation networks to link widely dispersed centers of population is essential. They call for heavy investment. The Nordic Countries (except Iceland) all have state-owned railroad systems. These have become increasingly important around major urban centers as the numbers of commuters have risen.

High levels of car ownership have created a demand for an effective road network. In Norway the mountainous terrain presents major problems for highway construction, but new tunneling technologies have improved accessibility to many isolated settlements that previously had to rely on slow ferries or suffer the inconvenience of snowbound roads. In other places – notably Denmark – ferries are being replaced by bridges. Key urban settlements throughout the Nordic Countries are connected by domestic air services. These are critical for linking Thorshavn in the Faeroe Islands and the Danish dependency of Greenland with Copenhagen, as well as Arctic Svalbard with northern Norway.

A vital link Tromsø is Norway's northernmost city. Located on an island, the city depends on a well developed system of roads and bridges. Others depend on Tromsø in turn; it is the terminus for air and sea transport links to far northern settlements.

CITIES IN A GREEN ENVIRONMENT

The cities of the Nordic Countries are generally very pleasant places in which to live. None of the region's capitals has a population exceeding 700,000 and there are only some 20 other municipalities larger than 100,000. With the exception of Denmark, where urban densities are comparatively high, cities occupy a disproportionately large area in relation to the number of inhabitants. There is plenty of room to expand, though in some cases difficult terrain may make development costly. Bergen, for example, is located among scenically exciting mountains and fjords, but complex and expensive "corkscrew" highways and tunnels are needed to open up access by road.

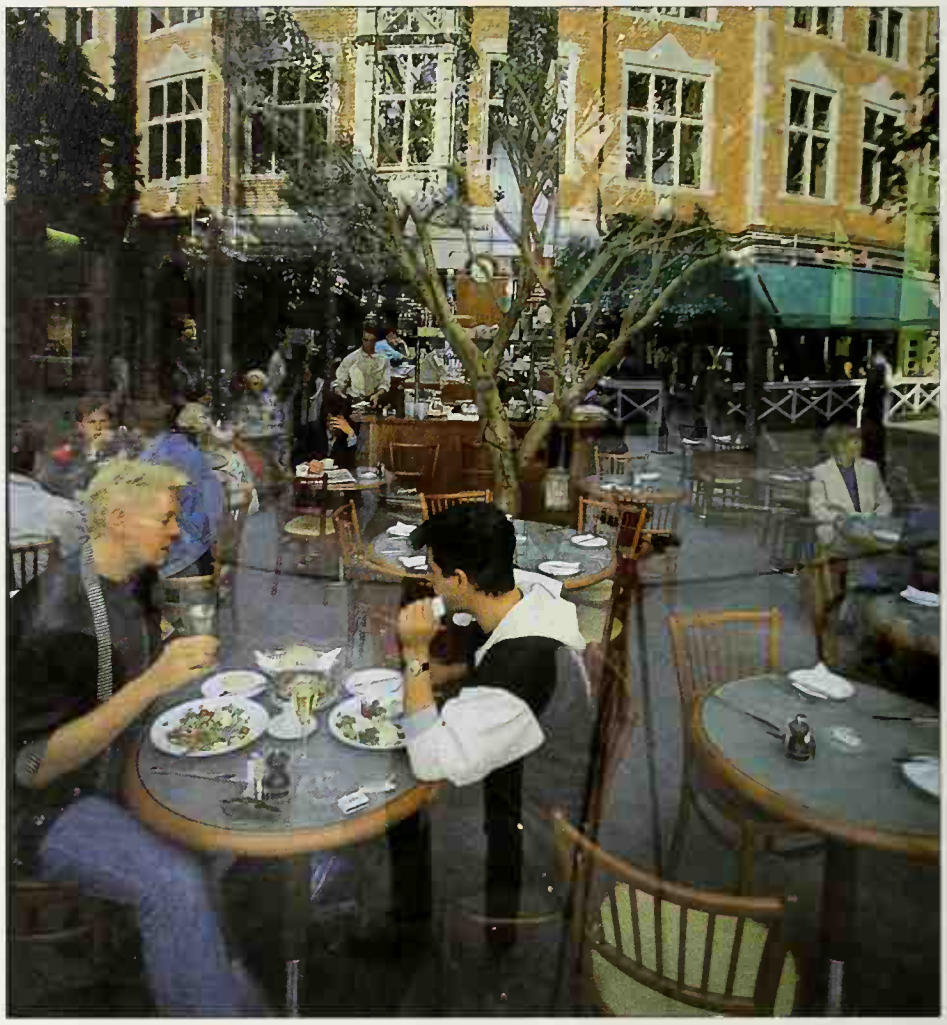
The topography and climate of the region presents other problems to city-dwellers. The shallow lakes and silty rivers of Finland are the cause of a sometimes unreliable water supply, and the disposal of sewage into the nontidal, brackish waters of the Baltic Sea also arouses environmental concern. Ice and snow are seasonal hazards in most Nordic cities: snow-clearance regulations have to be enforced, and icebreakers are stationed in the Baltic harbors.

Heating and lighting make heavy demands on the energy supply during the long, dark winters, and it is increasingly common for entire neighborhoods to be supplied from district heating plants. Reykjavik is exceptional in having thermal springs from which supplies of heat can be piped. As protection against winter cold, Nordic towns have indoor shopping malls and sports centers; out-of-town shopping centers are not common. In the past, building operations largely ceased during winter, but now construction sites are swathed in plastic sheeting and heated by hot-air machines so that work can continue. Finland's principal shipyard in Helsinki is roofed over for the same reason.

Garden cities

Within the urban areas, the environments of town and country merge freely with each other: tongues of woodland and water penetrate most towns in Norway, Sweden and Finland, giving them the appearance of garden cities. Reykjavik, by contrast, looks bare: few trees are able to withstand the harsh, windswept climate. Most urban families in Norway, Sweden and Finland have summer retreats. Copenhagen, much more a product of 19th-century industry and commerce than other Nordic cities, has its century-old *koloni* gardens – small hedged plots on the outskirts of the urban area to which apartment dwellers can migrate in summer. All the Nordic peoples have a special affection for Copenhagen – the largest and most European city in the region, its citizens have retained the art of living life to the full.

Most Nordic towns are well supplied with recreational facilities. The waterfront location that many towns enjoy makes boating a major activity, with a range of facilities from marinas and summer moorings to winter parking lots. Over much of Norway, Sweden and Finland, suburban ski trails, open-air ice rinks and even ski-jumps are provided by local government authorities.



Lunchtime reflections (*above*) Diners in a smart city restaurant, glassed over for winter protection, enjoy a leisurely view of the street. Standards of living in the cities of the Nordic Countries are among the highest anywhere in the world.

An architectural legacy (*right*) Called the "white city of the North" because of the pale color of the local granite in which it is built, Helsinki was made the capital of Finland when the country was annexed by Russia in the 19th century. The city's grand neoclassical buildings were designed by Russian architects in styles that are reminiscent of St Petersburg.

The Nordic Countries were among the first in Europe to pedestrianize their main shopping areas. The presence of prestigious modern buildings reflect a degree of regional rivalry: the city halls of Stockholm and Oslo, for example, vie with each other for architectural innovation. There is an increasing interest in preserving historic neighborhoods: the old wharves of Trondheim and Copenhagen have been transformed. Municipal enterprise has provided Oslo with a park devoted entirely to the sculptures of the artist Gustav Vigelund (1869–1943).

Pressures of success

The high standard of living enjoyed across the region raises its own problems. Despite immense building programs, the

URBAN PLANNING IN FINLAND

Finland has a long tradition of urban planning. As long ago as the 17th century, the new trading centers being established along the Gulf of Bothnia were laid out on a formal gridiron street pattern. This layout can still be seen in Kokkola, Raahe and Oulu along the coast, as well as in the newer inland cities such as Kuopio on the west shore of Lake Kallavesi. Since most towns were built of wood – and so were at great risk from fire – the width of streets, the spacing of housing lots and the location of public buildings were carefully controlled. The old capital of Turku was reconstructed along these planned lines after much of the city had been destroyed by fire in 1827.

When the Grand Duchy of Finland (previously part of Sweden) was annexed by Russia in 1809, the new administrative center, Helsinki, was designed by architects and planners from St Petersburg. The splendid neoclassical city they created is strongly reminiscent of the northern Russian city.

The 20th century has not been lacking in planning opportunities. The need to repair wartime damage in Rovaniemi, the capital of the Lapland province, gave Finland's leading city planner, Alvar Aalto (1898–1976), the chance to redesign the town completely. Tapiola, a garden city to the west of Helsinki, is probably the outstanding example of contemporary urban planning.

level of single occupancy – which runs at one in three properties in Sweden – creates pressure on living accommodation. The growing number of cars in the cities causes acute traffic congestion.

Oslo has faced up to its traffic problem by establishing a ring of toll-gates at the approaches to the downtown area and charging all vehicles entering the city; Bergen, Trondheim and Stockholm plan to follow suit. Tens of thousands of cyclists – who constitute an important voting lobby – use Copenhagen's streets and are provided with special bicycle lanes. Both Helsinki and Copenhagen have retained their original tramway system. Oslo has a long-established light railroad network and Stockholm has a highly effective underground rail system.

Stockholm – the town between the bridges

Stockholm occupies some 20 islands and peninsulas on Sweden's southeast Baltic coast. The site is emerging from the sea. The stockaded island fortress lying between the Baltic Sea and Lake Mälaren became the center of the developing Swedish state when nearby settlements such as Sigtuna and Uppsala lost their access to the sea. Today the original old town – the *Staden mellan broarna*, or "town between the bridges" – with its medieval streets, old churches, parliament buildings and royal palace remains at the heart of the city, linked to the surrounding islands by a network of roads and bridges.

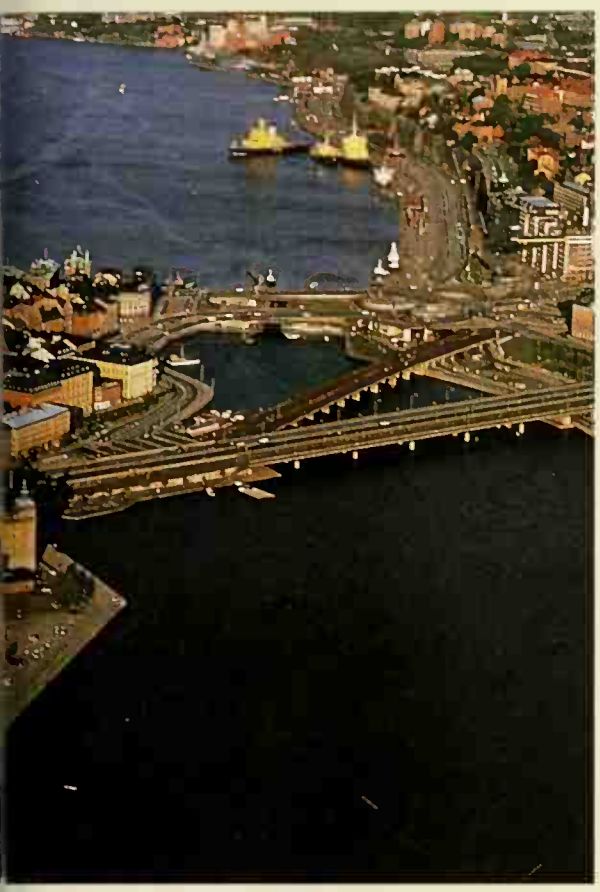
North and south of *Gamla Sta'n* (the Old Town), renaissance planning is reflected in the street layout. Norrmalm houses the city's commercial, financial and entertainment areas, and contains Stockholm's finest shopping street, Drottninggatan. Farther to the northeast is Östermalm, a century-old residential district with boulevards comparable to those of 19th-century Paris. The older suburbs, which include oases of green space, contain some fine early 20th-century villa and garden city development. Beyond stretches the belt of satellite suburbs, some with modern manufacturing parks. As these have expanded they have swallowed up older rural settlements.

An efficient subway system and suburban railroad network knits the parts of Stockholm together. It was one of the first cities in Europe to tackle the problems of slow-flowing city traffic by planning an elaborate complex of one-way streets and interchanges. The city's location raises several problems for planners and architects. It is built on a bedrock of granite, which affected the development of urban services in the days before modern methods of blasting and drilling became available. All the necessities of modern urban living – the subway system, pipes for water supply and sewage disposal and underground electricity and telephone cables – have to be accommodated in this layer of granite.

The city makes heavy demands on local energy supplies, especially during the long winter months. For a long time timber was shipped into the Stockholm area – which has no immediate sources of energy – for use as fuel. In recent years Stockholm has acquired hydroelectric power sites across the border in Norway in anticipation of expanding needs.

The Venice of the North (*above*) The Old Town is built on three small islands. Seen here from the west, the large, square building at the far side is the Royal Palace; to its left is the Parliament. With so many miles of waterfront, it is not surprising that boats and boating are still important in the life of Stockholm's citizens.

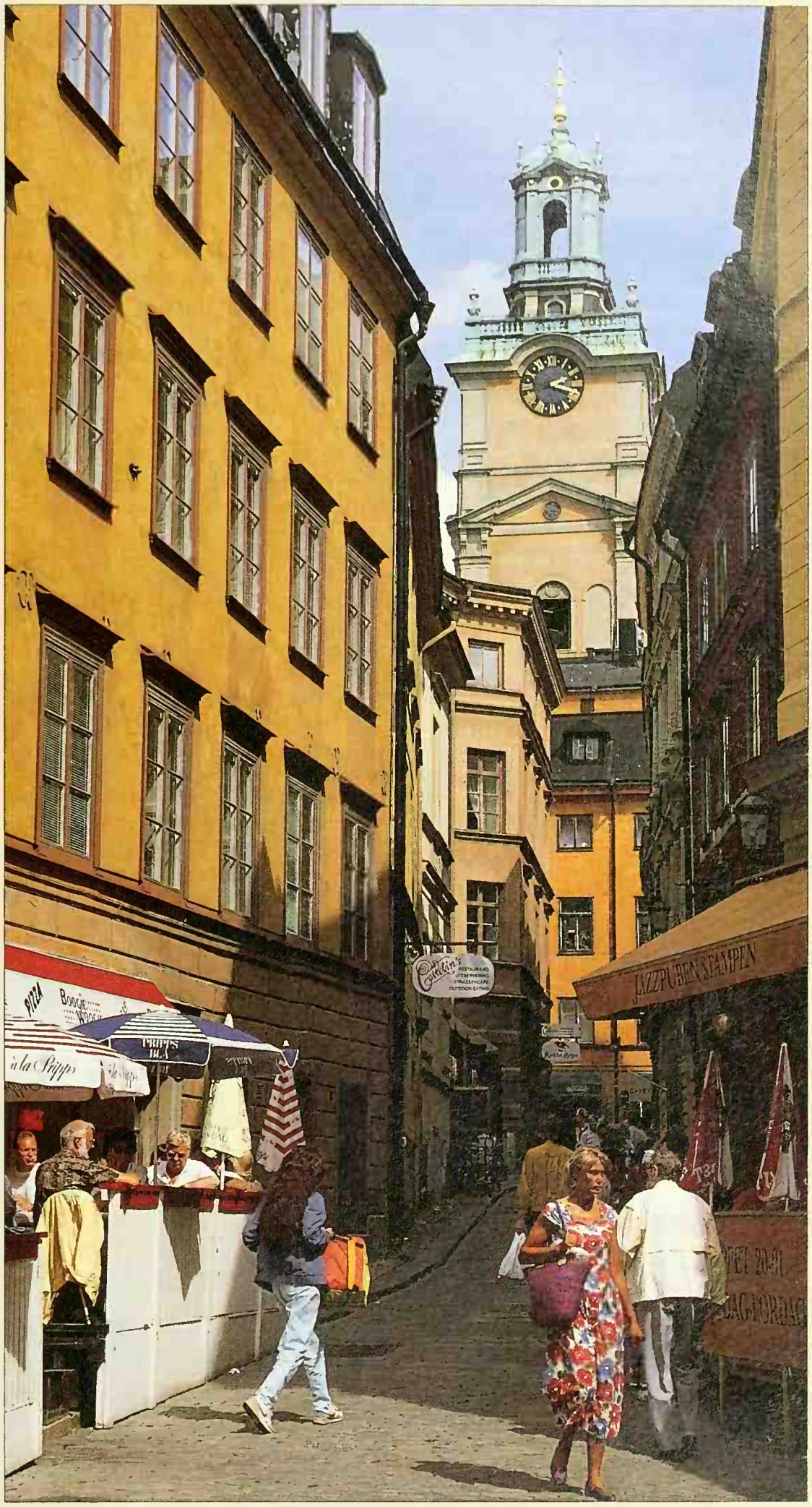
Northward expansion (*below*) Stockholm first began to spread onto the mainland in the 19th century when Norrmalm, the commercial and theater district, and Östermalm, a residential suburb, were first developed. The city's many parks and open spaces make it a pleasant place to live.



Urban renewal

During the last 40 years planners and architects have transformed two of Stockholm's central areas. Shortly after World War II, much of the 19th-century district of Norrmalm was rebuilt. A series of highrise offices and an extensive pedestrianized area – both of which were new ideas in European urban planning – were grafted onto Drottninggatan and the old marketplace of Hötorget. The Old Town was also a target for renewal. Its tall houses – dating back to the 17th and 18th centuries – built on a network of narrow alleyways had long been neglected. An extensive program of restoration transformed previously rundown dwellings and warehouses into attractive apartments, studios and offices.

Stockholm has always been well provided with open spaces. Parks, gardens and waterfront promenades are complemented by carefully maintained civic cemeteries as well as old churchyards. Recreation is an important part of the city's life. Most families have access to a boat for the summer months; in winter open-air ice skating rinks are provided, together with cross-country skiing on the edge of the city. The large number of indoor tennis halls reflects the popularity of a sport in which the Swedes have become internationally renowned.



Pedestrianized precincts The tower of the Storkyrkan, or cathedral of St Nicholas, overlooks this narrow alleyway in the Old Town. Many of its twisting streets have been closed to traffic. Crowded with antique shops and restaurants, they are popular with tourists and local shoppers. Some of the old burghers' houses are still private homes, but most have now been converted to offices.

GOVERNMENT

A SHARED PAST · GOVERNING BY CONSENSUS · KEEPING A NORDIC BALANCE

The five Nordic states have evolved over a thousand years from tribes who gradually recognized the overlordship of rulers based in central Norway, eastern Sweden and eastern Denmark. During the migrations of the Viking period people from these areas settled in the Faeroe Islands and Iceland. Finland became a duchy of Sweden; it was later annexed by Russia. For a time all the states of the region recognized the sovereignty of Denmark. Sweden was the first to become independent of the Danish crown, in the 16th century. Today all are parliamentary democracies. Denmark, Norway and Sweden are monarchies, Iceland and Finland republics. The largest island group – the Faeroes – is part of the Danish state; Jan Mayen and the Svalbard islands belong to Norway, the Åland Islands to Finland.

COUNTRIES IN THE REGION

Denmark, Finland, Iceland, Norway, Sweden

Island territories Åland Islands (Finland); Faeroes (Denmark); Jan Mayen, Svalbard Islands (Norway)

Territories outside region Greenland (Denmark)

STYLES OF GOVERNMENT

Republics Finland, Iceland

Monarchies Denmark, Norway, Sweden

Multi-party states Denmark, Finland, Iceland, Norway, Sweden

One-chamber assembly Denmark, Finland, Norway, Sweden

Two-chamber assembly Iceland

CONFLICTS (since 1945)

Interstate conflicts Iceland/UK 1956–58, 1974–78 (Cod Wars)

MEMBERSHIP OF INTERNATIONAL ORGANIZATIONS

Council of Europe Denmark, Iceland, Norway, Sweden

European Community (EC) Denmark

European Free Trade Association (EFTA) Finland, Iceland, Norway, Sweden

North Atlantic Treaty Organization (NATO) Denmark, Iceland, Norway

Nordic Council Denmark, Finland, Iceland, Norway, Sweden

Organization for Economic Cooperation and Development (OECD) Denmark, Finland, Iceland, Norway, Sweden

Notes Iceland has no military forces and is not a member of NATO Military Command

Norway has a territorial claim in Antarctica

A SHARED PAST

The modern Nordic states began to emerge at the beginning of the 19th century. The Treaty of Vienna (1815), which concluded the Napoleonic wars, confirmed the separation of Finland from Sweden and its new status as a grand duchy of the Russian empire; it was allowed a measure of self-government. The Norwegians set up an independent parliament in 1814 but were forced into an unequal union with Sweden under a common monarch. External affairs were controlled by Sweden.

The Faeroes, Iceland and the recently acquired colony of Greenland remained with Denmark, but the disputed German-speaking territories of Schleswig and Holstein in the south, acquired in the 15th century, were ceded to Germany in 1864: in 1920, after a plebiscite, the Danish–German border was moved about 50 km (30 mi) to the south in order to bring areas with a Danish-speaking majority within Denmark.

Norway separated wholly from Sweden in 1905, and Iceland from Denmark in 1944. Following a referendum, Greenland was granted full self-government in 1981. Finland declared its independence from Russia during the revolution of 1917–18. In 1939 the two countries were involved in the 15-week "winter war", which Finland lost. It later joined Germany in attacking the Soviet Union, but agreed a separate armistice in 1944, with the loss of territory in Vyborg and southern Karelia, northwest of Leningrad.

About 33,000 Lapp (Sami) people are scattered over northern Norway and Swedish and Finnish Lapland. State boundaries in Lapland were marked out between 1751 and 1826, but those Lapps who herded reindeer were allowed to cross frontiers during their migrations. The establishment of a common labor market among the Nordic states in 1954 extended these rights to all workers.

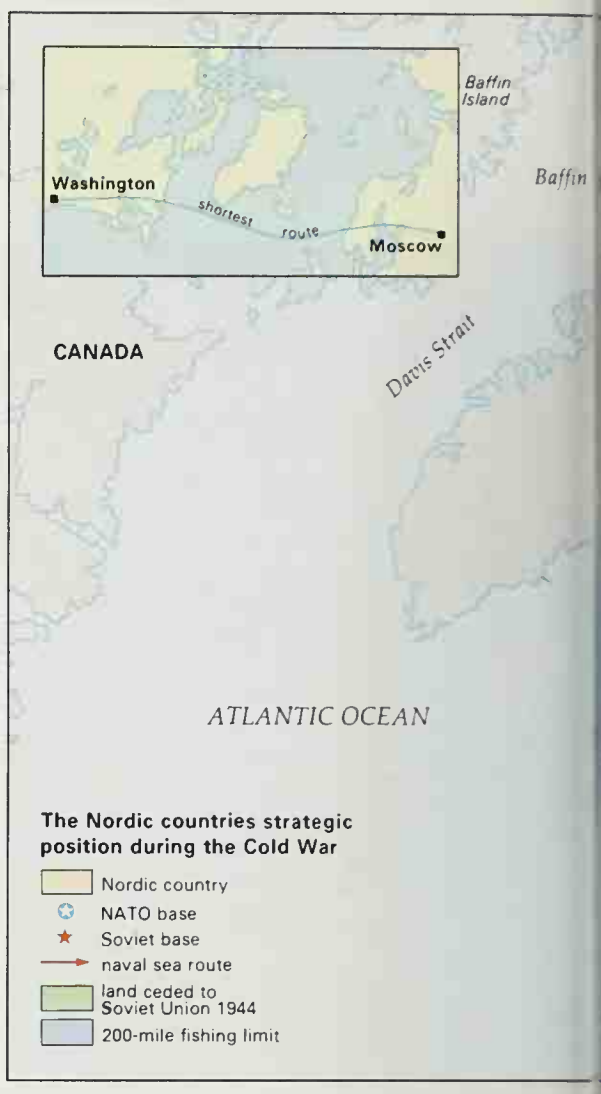
Parliamentary constitutions

As a result of their shared history, all five states have many political features in common. All have long traditions of the rule of law and of the making and enforcement of the law at representative assemblies (the Icelandic parliament, the Althing, was first established in 930). Although the crowns of Denmark and Sweden had accumulated power over state and church, which were very closely linked, amendments to their 19th-century constitutions gradually established the supremacy of parliaments. By the early 20th century the decisions of government required the support of a majority in elected parliaments.

Norway chose a king at independence in 1905, but Finland (1918) and Iceland (1944) chose presidents. The Finnish president remains a powerful constitutional figure. Elected every six years, the president can dissolve parliament, conduct foreign relations (subject to review by parliament), and delay legislation. The Icelandic president may exercise some influence on the formation of governments. The same is true of the Danish and Norwegian monarchs, but in Sweden this function devolves on the speaker of parliament, and the role of the crown is virtually ceremonial.

The island territories

Denmark, Finland and Norway's island territories are now largely self-governing



Cold War vulnerability The Nordic Countries – on a direct route between Washington DC and Moscow – were vulnerably positioned between the two superpowers of the Cold War, and awareness of the threat of nuclear war was high. Soviet nuclear submarines, leaving their bases in the Baltic and White Seas, passed close to the shores of all five countries

island territories. The Faeroe Islands have a local assembly but are also represented by two members in the Danish parliament, which legislates for foreign affairs, law, social affairs and education. The Åland Islands, confirmed as a part of Finland by a League of Nations agreement of 1921, constitute a self-governing, Swedish-speaking province of Finland with its own assembly, which agrees local legislation with the Finnish president.

The Svalbard islands, of which Spitsbergen is the largest, were unpopulated until 1906. In 1920 Norway was granted sovereignty over Spitsbergen, but seven other states share the right to exploit minerals there, and coal is still mined by Norwegian and Russian corporations. Today the islands have a population of approximately 1,400 Norwegians and 2,500 Russian citizens. No military installations are allowed on the islands.

Celebrating independence On Independence day (17 May) Norwegians, many wearing national costume, parade down Oslo's Parliament Hill. A young nation by European standards, Norway did not become fully independent until 1905. It remains fiercely proud of its national identity and traditions.

GOVERNING BY CONSENSUS

Nordic society is structured to encourage shrewd appraisal, caution, and conservative attitudes toward change, and the close cultural and linguistic links between the states of the region have allowed the development of similar political institutions and parties in each one. Political interest is high, with over 80 percent turnouts normal in general elections, which are held at fixed four-yearly periods (three years in Sweden): the Norwegian parliament cannot be dissolved between elections. Parliaments are elected by proportional representation, and the prime minister and cabinet drawn from the party, or group of parties, commanding a majority of votes.

Parliaments can modify the constitution, as happened in Sweden in 1971 and 1975 during the premiership of Olof Palme (1927–86). However, they are limited by the constitutionally defined powers of many administrative agencies that are not subject to direct intervention by ministers, though they may enjoy informal links with them. These agencies are responsible to the cabinet, and some of them, such as Swedish Railways, may operate as commercial enterprises, deriving part of their income from the state. Political parties and relevant interest groups, such as trade unions and employers' organizations, are represented on their governing boards.

The machinery of consultation

Parliaments have one chamber, though in Norway the elected members divide into two groups to discuss legislation. They are more concerned with the discussion than the formulation of policy, and a great deal of parliamentary work, especially the drafting of new laws, is done by standing committees with all-party membership proportionate to the number of votes cast. Widespread consultation is normal, and sometimes mandatory, before new policy can be made, and the administration agencies are strongly represented on the commissions of inquiry. Interest groups and other organizations may also be involved; consultation thus imposes a lengthy time-scale on policy change.

National referendums may also be held to decide policy on such issues as whether Norway and Denmark should join the European Community (EC) (in

1972) or Sweden abandon nuclear power (in 1980). The press has constitutional guarantees that enable it to act as a watchdog over government. The institution of an independent investigator of complaints against maladministration (the ombudsman), first introduced in Sweden in 1713, has spread to the other countries of the region and farther afield as well.

The party line-up is not identical in all five states, but parliaments may include – from left to right across the political spectrum – communists, socialists, social democrats, a center party (formerly representing agrarian interests), a Christian party, liberals and conservatives. In the late 1950s "progressive" parties were formed with programs to reduce taxation, which has been at a high level in order to maintain the comprehensive systems of state welfare that are characteristic of

WOMEN IN POLITICS

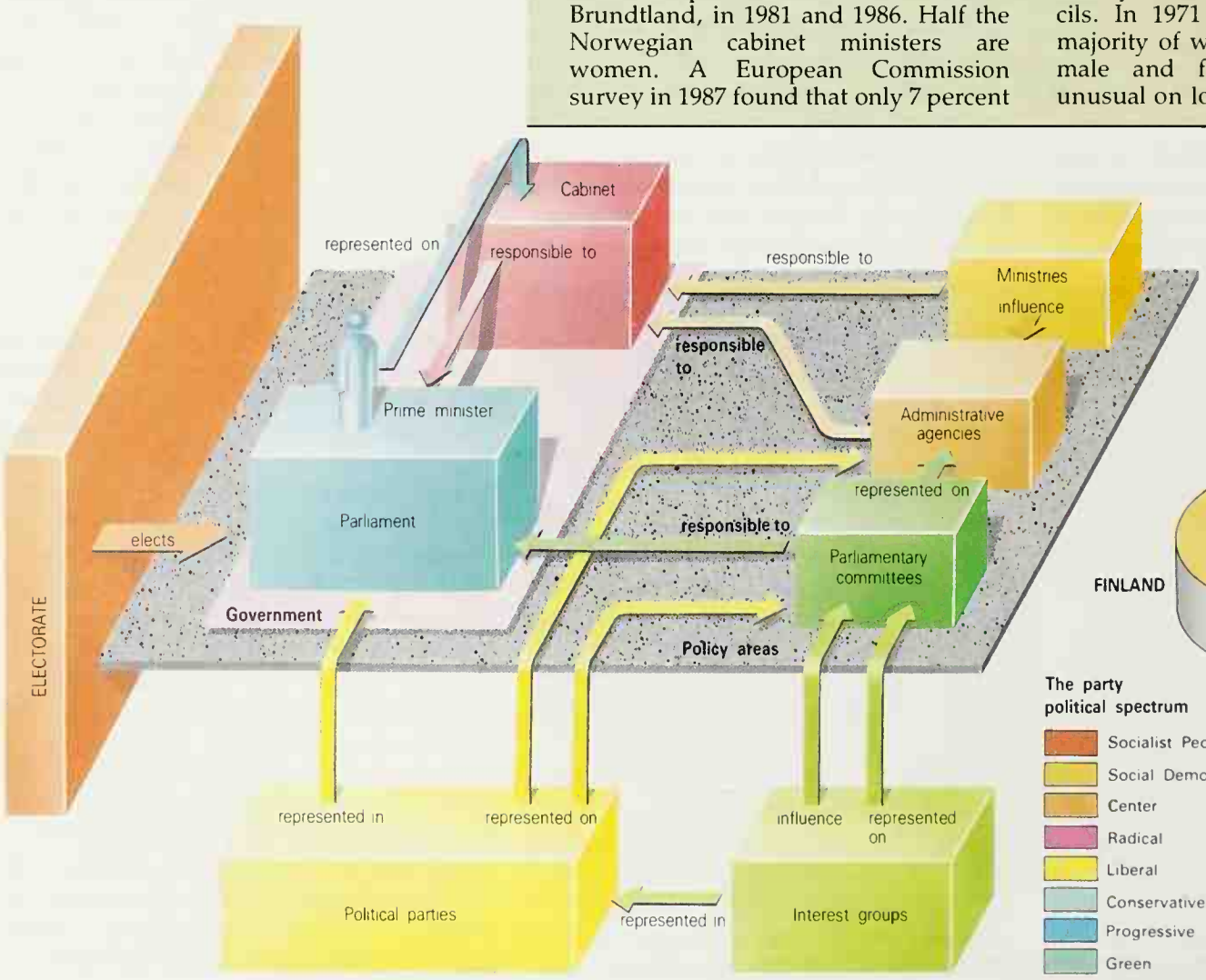
Women in political systems throughout the world have a disproportionately small role in government. Scandinavian countries were among the first to give women the vote at the beginning of the 20th century, and Scandinavian women now achieve a higher share of parliamentary seats than in any other of the world's democratic assemblies, ranging from 20 percent in Iceland to 37 percent in Sweden. The only other states to approach this were some communist regimes, for example East Germany and the Soviet Union. Women continue to be poorly represented in major democracies such as Britain, France, Japan and the United States, where representation may be below 6 or 5 percent.

Between 1945 and 1979 individual women had achieved a major position of power in only four states – Britain (Margaret Thatcher), India (Indira Gandhi), Israel (Golda Meir) and Sri Lanka (Sirimavo Bandaranaike). Women generally remained underrepresented in their national assemblies. Iceland elected a woman president, Vigdis Finnbogadottir, in 1980 and Norway a woman prime minister, Gro Harlim Brundtland, in 1981 and 1986. Half the Norwegian cabinet ministers are women. A European Commission survey in 1987 found that only 7 percent of Danish men (compared to 30 percent in Germany) expressed greater confidence in men as political leaders.

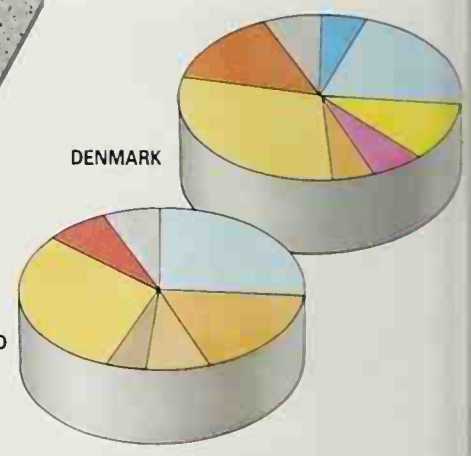
A woman prime minister Gro Harlim Brundtland, Norway's former prime minister, with some of her male colleagues in the cabinet.

Ten major political parties in Scandinavia and Finland have a quota (usually 40 percent) of party offices for women. A Women's Alliance party was set up in Iceland in the belief that traditional political parties incorporate women within male political structures. In 1983 it became the first specifically women's party to sit in a national parliament, and in 1987 won six seats. Women are also well represented on county and district (municipal) councils. In 1971 Oslo city council had a majority of women members; parity of male and female members is not unusual on local councils.

Policy making in Sweden The Swedish parliament (Riksdag) discusses policy, which is decided by the prime minister and cabinet in consultation with the political parties and other interest groups inside and outside parliament. Execution of policy is in the hands of about a dozen administrative agencies.



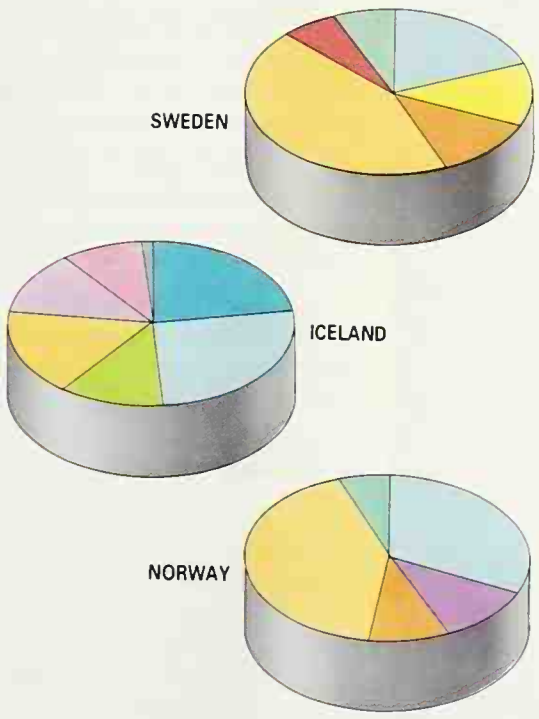
The political spectrum The composition of political parties is markedly similar in all five states of the region.



The party political spectrum

- Socialist People's
- Social Democrats
- Center
- Radical
- Liberal
- Conservative
- Progressive
- Green
- Communist
- Swedish speaker's
- Agrarian
- Citizens
- Peoples' Alliance
- Women's Alliance
- Christian People
- other

Swedes mourn Flowers are piled at the place where Olof Palme (1927–86), twice Labor prime minister and a champion of Third World policies, was shot dead in an apparently motiveless crime.



Scandinavia. Some of the progressives have subsequently opposed liberal immigration policies.

Party loyalty is very strong among voters, and the proportion of seats held by each party changes only slightly from one election to the next. The number of seats held by the parties of the left and right are evenly balanced, but the parties on the right find it more difficult to form a common program than do those on the left. These circumstances enabled the Social Democratic Labor Party of Sweden to form the government (usually in alliance with some of the smaller parties) from 1933 to 1976 and again from 1982 to 1991, though it has rarely enjoyed an absolute majority of seats.

Sectional interests

A minimum-vote threshold excludes the smallest parties from parliament but, outside Sweden, small parties – often representing limited sectional or regional interests – have survived to influence policies by supporting larger parties that lack an overall majority. In Iceland, for example, there is a women's party, and in Finland a Swedish-speaker's party. In 1988 the Green party was represented for the first time in the Swedish parliament. Representation on administrative agencies and local government bodies is also usually proportionate to party voting strength, and so party leaders have strong incentives to reach compromise agreements with each other.

The larger political parties are pragmatic rather than ideological, always seeking to widen their appeal to voters in the middle ground. Social Democratic governments have been primarily concerned with the welfare of individuals and regions rather than with state ownership of industrial firms. Coalition governments of the right have continued to support state welfare provision. Unlike many other Western European states, where each government may counter the programs of its predecessor, the changes implemented by Scandinavian governments are less dramatic and wideranging.

KEEPING A NORDIC BALANCE

Cooperation between the neighboring states of Scandinavia and Finland has always depended upon achieving a balance between the common interests that pull them together and the need to maintain independent relations with other powers, which may drive them apart. For most of the period since World War II each has sought close cooperation with the others through a series of cultural, political and economic alliances. The 1970s and 1980s, however, saw some attempt to assert individual state interests more strongly.

The chief instrument of cooperation is the Nordic Council, which was established in 1951. Finland joined in 1955. The representatives from all five parliaments and cabinets who comprise the council consider many issues of common interest,

Saying no to Europe In summer 1992 Danish voters confounded politicians moving toward greater integration within the European Community by voting in a national referendum to reject the terms of the Maastricht treaty, which would have taken that process a stage further. Here campaigners against the treaty are canvassing support in Copenhagen for a No vote. Ratification of the treaty by all the member states was necessary to implement its clauses, and so the decision by Denmark – one of the smallest countries in the EC – caused a major political upset.

World leaders at Reykjavik The Icelandic capital was chosen in 1986 as the meeting place for President Ronald Reagan of the United States and Mikhail Gorbachev of the Soviet Union. Following the success of their preliminary discussions here, the first nuclear arms reduction treaty between East and West was signed a year later in Washington DC.

excluding national defense and relations with non-Nordic countries. It has set up planning regions across state boundaries and initiated research to explore common social and cultural problems. Considerable progress has been made in harmonizing social legislation.

There has been less success in developing common economic policies, though steps toward this have included the establishment of the Scandinavian Airlines System (SAS), comprising the national airlines of Denmark, Norway and Sweden, in 1950 and a combined railway tariff system in 1953. Proposals for a Northern Economic Union (Nordek) with a common external tariff and trade policy were abandoned in 1970 when Finland felt unable to join. Iceland chose not to participate in proposals for economic union because of concern over markets for its principal export, fish.

Intense political debate was generated by Denmark's and Norway's applications to join the European Community (EC). Denmark joined in 1973, but farming, fishing and some rural manufacturing interests united to defeat Norway's application. Swedish business interests have always favored joining but successive governments felt that the provisions for entry laid down in the Treaty of Rome (1957), which established the EC, would breach Sweden's longstanding and highly regarded policy of political neutrality.

Despite these fears, in July 1991 Sweden applied to join the EC, and Finland and Norway later indicated that they would also apply. However, the ambivalent feelings that the Nordic Countries have for the EC were shown yet again in June 1992 when the Danish people voted not to ratify the Maastrict Treaty, setting out the ground for still greater integration within the EC, which needed the approval of all member states.

Questions of defense

Apart from Sweden, which has not been involved in war since 1806, the region was drawn into the conflicts of World War II: Finland fought the Soviet Union twice; Denmark and Norway were invaded by Germany; the Faeroe Islands and Iceland were occupied by British and US forces. Immediately after the war Sweden failed to persuade its neighbors to set up a common defense policy. Finland signed a non-aggression pact with the Soviet Union in 1948; Denmark, Iceland and Norway joined the North Atlantic Treaty Organization (NATO) a year later. Except for US-maintained NATO bases at Thule in Greenland and Keflavik in Iceland they do not allow the permanent stationing of foreign troops or nuclear weapons on their territory. Supporters of the concept of "Nordic Balance" argue that the limited commitment to NATO of Norway and Denmark helps to maintain the political independence of Finland.

Finland's postwar treaty (the Mutual Assistance Pact or YYA Treaty) with the Soviet Union bound it to repel attacks on the Soviet Union across Finnish territory. By its terms Finland's neutrality was respected. While it retained its capitalist economy, parliamentary democracy and trading links with Western Europe, the defense clauses were designed to prevent the smaller power from becoming a springboard for an attack on Leningrad by Western powers. The Soviet government dissuaded Finland from joining Nordek in 1970, but refrained from overt interference in internal Finnish politics.

In the early 1980s there were suspicions that Soviet submarines were lurking around Swedish naval bases. These appeared to receive confirmation when one ran aground in 1982. This led to a substantial increase in the Swedish defense budget for 1987–92, and heightened enthusiasm among the Swedish people for the establishment of a nuclear-free zone in northern Europe that would encompass not only the Nordic states but also the heavily militarized Kola Peninsula.

The Nordic Countries played a prominent role in the process that led to the separation of the Baltic states from the Soviet Union in 1991. Iceland was the first country to recognize the new states on 26 August 1991, and Sweden was the first to open an embassy in Vilnius, capital of Lithuania.

ICELAND'S COD WARS

Traditionally, the "high seas" were held to be under no national jurisdiction, and the claims of maritime states over coastal waters extended only to 5 km (3 nautical mi). The development of huge factory ships to operate in distant waters and other modern methods of fishing, as well as the exploitation of fuel and other mineral resources, made states more conscious of the potential value of their coastal waters. Fishing territories were ever more aggressively protected and extended, leading to a series of disputes between states, the most famous of which were the so-called "Cod Wars" (1956–58 and 1974–78) between Iceland and Britain and other Western European fishing nations. Its total dependence on fish exports led Iceland to extend its territorial fishing waters, and to protect them with gunboats. In the mid-1970s several clashes took place in the North Atlantic when British naval frigates were sent to support trawler fleets fishing in the disputed waters.

It was largely as a result of pressure from Iceland that the United Nations Conference on the Law of the Sea (UNCLOS) in 1982 recognized a territorial waters limit of 22 km (12 nautical mi) for coastal states, with further provision for an exclusive economic zone of 370 km (200 nautical mi) in which fishing and mineral rights are protected.

Conflict at sea An Icelandic gunboat alongside a British trawler fishing in the North Atlantic at the height of the Cod War in the 1970s.

The role of the peacekeeper

The Nordic states have a long history of working to promote international peacekeeping operations and of fostering peace-seeking conferences and institutions. In 1917 the kings of Denmark, Norway and Sweden made the first proposal for a League of Nations, an idea that had originated with Fridtjof Nansen (1861–1930), the Norwegian polar explorer. Scandinavians have played an active part in the work of the League and its successor, the United Nations, providing many of its diplomatic personnel and high-ranking officials, including the first two general secretaries of the UN, the Norwegian Trygve Lie (1896–1968) and the Swede Dag Hammarskjöld (1905–61).

All the Nordic states support capitalist economic systems yet have enjoyed long periods of socialist-dominated politics. This made their governments particularly acceptable as intermediaries between the superpowers of East and West: they condemned those policies of both superpowers that appear to increase international tension. They perform a worldwide role in attempting to bring a speedy end to armed conflict wherever it may happen to take place, and offer negotiating facilities to warring sides once other aspects of international diplomatic machinery has been found to fail.

Troops from the region have served in UN peacekeeping forces from the Congo in the 1960s to Cyprus, Lebanon and Namibia in the 1980s and Bosnia in the 1990s. In addition, Nordic governments have tried to promote economic stability in the Third World to reduce the danger of conflict there, and have consistently supported programs for dialog between North and South with the ultimate objective of a new international economic order. Gro Harlim Brundtland chaired a UN Committee on Environment and Development (1983–87), which published a report, *Our Common Future*, listing threats to the environment and calling for development policies to feed the world's increasing population. Nordic governments have strongly opposed the apartheid policies of South Africa and many other violations of human rights.

Peace conferences

Several peace conferences have been held in the region. Finland hosted the first Strategic Arms Limitation Treaty talks (SALT I) between the United States and the Soviet Union (1969–71), as well as the Conference on Security and Cooperation in Europe (1975). Attended by the leaders of 33 European states, as well as those of Canada and the United States, this affirmed the post World War II boundaries of Europe, and led to the Helsinki declaration on human rights. An associated foreign ministers conference on confidence, security-building and disarmament in Europe took place in Stockholm in 1985. In 1986 the Icelandic capital of Reykjavik was chosen by US

A prize for peace The Nobel peace prize is awarded at an annual ceremony every December in Oslo. It is the world's most prestigious international award, and is given to an individual who is considered to have best promoted and pursued the interests of peace. It has often been the cause of political controversy. Here Oscar Arias Sanchez, the president of Costa Rica, holds his citation and medal after receiving the award in 1987. His plan to bring about a ceasefire between guerrilla groups led to an accord being signed by five Central American presidents, but it failed to win international backing, particularly from the United States

Two Swedes killed in peace missions Count Folke Bernadotte (1895–1948), nephew of the Swedish king, was murdered in Jerusalem by members of the Jewish Stern Gang while acting as United Nations mediator in Palestine (*top*). Dag Hammarskjöld (1905–61), secretary general of the UN, was killed in an air crash in Northern Rhodesia (now Zambia) while trying to bring peace to the newly independent state of the Congo (Zaire), divided by civil war (*above*).

Keeping peace around the world Troops from the region have served with United Nations security forces in many major trouble spots throughout the world. These Finnish soldiers are engaged in keeping the peace between warring factions in south Lebanon.

President Ronald Reagan and Soviet Secretary General Mikhail Gorbachev as the venue for the arms reduction talks that preceded the Intermediate Nuclear Forces (INF) treaty signed in Washington the following year.

The international prizes awarded each year by the Nobel Foundation of Sweden to commemorate achievement in various fields of human activity have included since their inception in 1901 a prize for achievement in promoting peace. Given on the advice of the Norwegian parliament (chosen because it did not then have responsibility for foreign policy), it has been given seven times to Scandinavians, including the Norwegian Fridtjof Nansen for his work for refugees.

Recent recipients have been Soviet human rights protestors Alexander Solzhenitsyn and Andrei Sakharov (1970 and 1975), President Anwar Sadat of Egypt and Prime Minister Menachem Begin of Israel (1978), and Costa Rican President Oscar Arias Sanchez (1987). In 1966, to commemorate 150 years of peace, the Swedish parliament established the Stockholm International Peace Research Institute, whose international staff publish studies on disarmament and arms regulation. The willingness of Cold War world leaders to welcome detente and look for practical solutions to reduce international tension owed more than a little to the peace-seeking efforts of Nordic leaders and people.

ENVIRONMENTAL ISSUES

THE CHANGING LANDSCAPE · POLLUTION IN THE SEAS AND WINDS · LEADING THE WAY

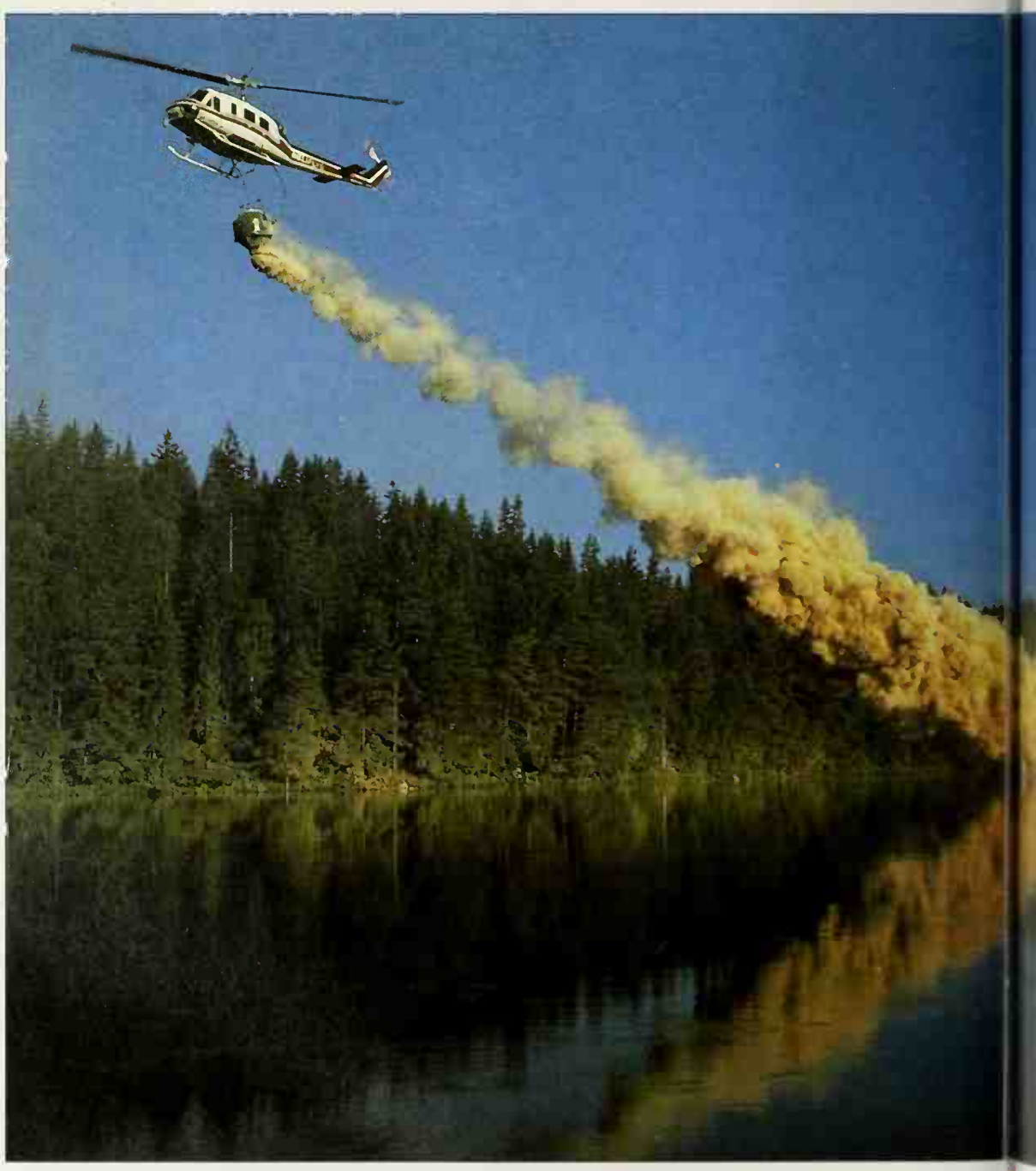
Most environmental problems in the Nordic Countries are related to air and water pollution, much of which originates outside the region. Acid rain, carried by the prevailing winds from the industrial areas of Great Britain and continental Europe, is poisoning lakes, rivers and forests. Many rivers in the region, as well as others rising in Germany, Poland and the former Soviet Union, drain into the shallow Baltic sea, which is becoming increasingly polluted by industrial waste and pesticides. Oil spills here and in the North Sea endanger marine life. Concern for the preservation of their remaining wildlife habitats and for the health of their fishing and forestry industries is leading the people of the region to tackle these problems with an energy and willingness that is not always apparent in other countries.

THE CHANGING LANDSCAPE

The Nordic Countries are more sparsely populated than other parts of Europe, and human impact on the environment has on the whole been less: sizeable areas of natural wilderness are still to be found, especially in the far north of the region. In the past, the biggest changes to the natural landscape resulted from farming. The region's fertile soils are restricted to coastal areas of southern Norway and Sweden, parts of western Norway, and to the whole of Denmark (except west Jutland), where most of the native mixed deciduous forests were cleared to make way for agriculture several centuries ago.

In Denmark, reclamation of land began in the mid 19th century when large areas of heathland and bog were improved to create additional farmland. Conifer plantations have been established on the North Sea coast to prevent the coastal sand dunes encroaching onto agricultural land. Iceland's native woodlands were cleared about a thousand years ago by the original Viking settlers, and today the windswept island is sparsely vegetated.

With fishing, timber has always been the region's greatest natural resource, exploited for building, shipbuilding and fuel. During the 19th century, with the rising export demand for lumber and forest products, the mixed coniferous and deciduous forests in southern and central



Drastic measures for a drastic situation (*below*) A helicopter releases a cloud of limestone into a Swedish lake to counteract the effects of acid rain. The Nordic Countries are pioneers in ways of tackling pollution.

COUNTRIES IN THE REGION

Denmark, Finland, Iceland, Norway, Sweden

POPULATION AND WEALTH

	Highest	Middle	Lowest
Population (millions)	8.4 (Sweden)	5.0 (Finland)	0.3 (Iceland)
Population increase (annual population growth rate, % 1960–90)	0.8 (Iceland)	0.4 (Sweden)	0.4 (Finland)
Energy use (gigajoules/person)	199 (Norway)	157 (Iceland)	147 (Sweden)
Real purchasing power (US$/person)	16,820 (Iceland)	13,980 (Finland)	13,610 (Denmark)

ENVIRONMENTAL INDICATORS

CO_2 emissions (million tonnes carbon/annum)	15 (Denmark)	8.7 (Norway)	0.4 (Iceland)
Municipal waste (kg/person/annum)	474 (Norway)	408 (Finland)	317 (Sweden)
Nuclear waste (cumulative tonnes heavy metal)	1,900 (Sweden)	400 (Finland)	0 (Norway)
Artificial fertilizer use (kg/ha/annum)	2,917 (Iceland)	234 (Denmark)	136 (Sweden)
Automobiles (per 1,000 population)	406 (Sweden)	377 (Iceland)	311 (Denmark)
Access to safe drinking water (% population)	100 (Sweden)	100 (Iceland)	97 (Finland)

MAJOR ENVIRONMENTAL PROBLEMS AND SOURCES

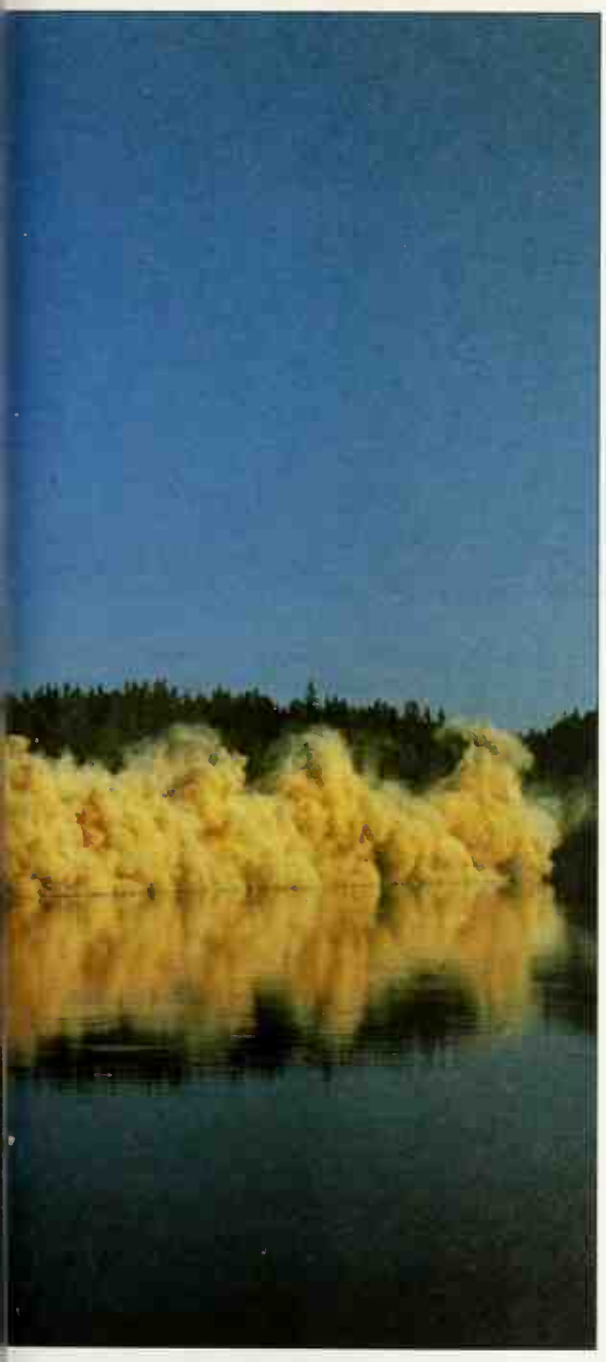
Air pollution: acid rain prevalent
River/lake pollution: high; *sources:* acid deposition
Marine/coastal pollution: medium; *sources:* industrial, agricultural
Land pollution: local; *sources:* industrial; acid deposition
Waste disposal problems: domestic; industrial
Major events: Aker river, Oslo (1980), acid leak from factory; Ålesund (1992), oil spill from tanker *Arisan*

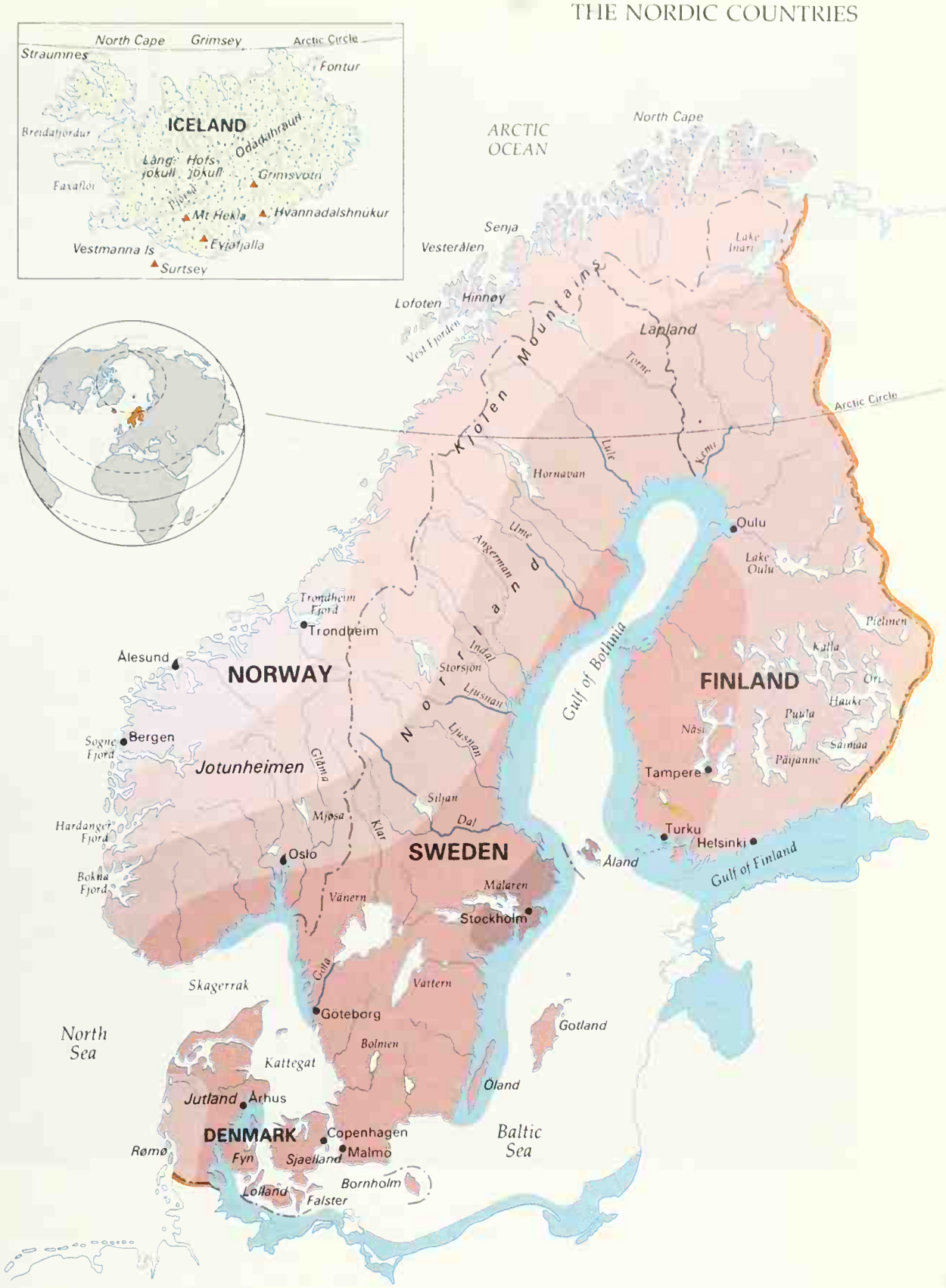
Scandinavia and the boreal coniferous forest that covered most of Finland, northern Sweden and parts of Norway began to be replaced by conifer plantations. Today they have almost entirely supplanted the native forests in these areas, and swamps and marshes have been drained to create new areas for forestry. Conifer plantations provide a relatively sterile environment for wildlife, and numbers of forest-dwelling and wetland species have declined alarmingly throughout the region.

The environmental impact of industry

The lack of indigenous coal reserves delayed the industrialization and urbanization of the region until the late 19th century, considerably later than most other parts of Europe. Change came about with the development of hydroelectricity. The fast-flowing rivers of the region were well suited to provide this, and many valleys were flooded in the course of constructing dams and reservoirs for the new hydroelectric plants (11 were built in Norway alone between 1896 and 1900). As roads were built to service them, the mountainous interior of the Nordic peninsula was opened up for the first time.

Because of the difficulty in transporting electricity across long distances, industrial development was scattered across the region, initially at waterfall sites and later where metal ores were extracted or on the coast where lumber, floated down the rivers, was processed for export. This





Key environmental issues

- major town or city
- major pollution event
- active volcano
- heavily polluted river
- area affected by permafrost
- severe sea pollution

acidity of rain (pH units)

- 4.2 (most acidic)
- 4.4
- 4.6
- 4.8 (least acidic)

Map of environmental problems (*above*) Acid rain, particularly devastating to Sweden and Finland, affects trees, soil and thousands of lakes and rivers. Pollution in the Baltic Sea is worst around the coast, but also affects deep water. The delicate permafrost area of Iceland could be at risk from global warming.

limited the spread of heavy, polluting industry. Large urban agglomerations, comparable to those of the European coalfield areas, developed only around the capital cities and Sweden's main port of Göteborg.

After World War II, however, the expansion of the metal smelting, wood pulp, heavy engineering, food processing and oil related industries created new problems of air and water pollution. Although industries are monitored and pollution limits have been established, regulations are not always observed: six out of ten Norwegian industries still discharge more than their official quotas permit. The growing affluence of the region's population has also increased levels of air pollution as the demand for energy to heat houses and run appliances has risen and car ownership has soared.

POLLUTION IN THE SEAS AND WINDS

The geographical position of the Nordic Countries makes them particularly vulnerable to pollution imported from outside the region. The North Sea has long been used as a dumping ground for western Europe's industrial and domestic wastes; industrial and sewage effluents discharge into it from all the countries around its shores. Currents carry this pollution toward the coastline of Denmark and Norway, where it contaminates beaches and also threatens fish stocks already made vulnerable by overfishing in the North Sea and the North Atlantic.

The exploitation of offshore oil reserves, with the risk of oil discharges, pose an additional environmental threat to marine life – one that is likely to grow as exploration extends farther into the North Atlantic and the southern Barents Sea. The construction of large terminals to store and process the oil have affected the Norwegian coastline. Spills from the heavy volume of international shipping that passes through coastal waters also endanger marine life.

In 1980, more than 50,000 seabirds were killed in the Skagerrak strait, between Denmark and Norway, when the Greek tanker *Stylis* discharged oil-contaminated ballast water into the sea. In January 1992 the bulk carrier *Arisan* ran aground near Ålesund on the west coast of Norway: the

Effluent pours out (*above*) from a paper mill at Grums on the northern edge of Lake Vänern, Sweden, where it is treated. High levels of mercury from effluent were found in local fish as early as the 1960s, and their consumption was banned.

fuel oil that spilled from the wreck ruined beaches and threatened the nearby seabird sanctuary at Runde. Seepages from the rusting tanks of the many ships (more than 2,109 since 1914) that have been wrecked along the Norwegian coast are also a source of contamination.

A growing environmental problem in the enclosed waters of the Skagerrak and Kattegat straits and the Baltic Sea is the seasonal appearance of algal "blooms" caused by eutrophication. Fertilizers draining into the sea from agricultural land cause high levels of nitrogen and phospherous to build up in the water. This results in the excessive growth of microscopic algae, and in sheltered coastal waters they may cover the surface for many kilometers. As this blanket is rotted down by bacteria the water is starved of oxygen, killing off aquatic life.

In 1988, a toxic algal bloom 10 km (6 mi) wide and 30 m (100 ft) deep moved through the Skagerrak strait, between Denmark and the Scandinavian peninsula, damaging marine life along more than 200 km (125 mi) of the coastline of western Sweden and southern Norway. Fish farms along the Norwegian coast were badly affected by the algal bloom. Fish farming, an increasingly important economic activity in the fjords of the long Norwegian coastline, itself pollutes coastal waters with waste feed and great quantities of fish feces, while the antiparasitic chemicals used to treat the fish harm other marine life.

A threatened sea

The shallow waters of the Baltic Sea, which is virtually tideless and almost landlocked, are heavily polluted with toxic waste and are especially vulnerable to eutrophication. Heavily polluted rivers drain into the Baltic from the industrial and agricultural heartlands of Poland and the former Soviet republics. Although intensive farming and forestry in Sweden and Finland contribute to the problem of fertilizer runoff, 60 percent of the nitrogen enrichment in the Baltic comes from the former Eastern bloc countries. The effects have been quite devastating: 100,000 sq km (39,000 sq mi) of the Baltic – nearly half of its deep waters – are virtually "dead".

A particular danger comes from the high levels of mercury discharged into the Baltic from the pulp and paper factories around its shores. Organic mercury compounds enter the food chain and affect in turn shellfish, fish, seals and seabirds. Levels of mercury in some fish are high enough to harm human health, and Denmark and Sweden have now banned the consumption of cod livers from the Baltic.

Pollution from the air

The prevailing winds carry air pollution to the region from other parts of Europe. It falls as acid rain, poisoning lakes and rivers, killing fish, and damaging trees and buildings. Most of the acid rain that occurs in Denmark, Norway and Sweden comes from Germany and Britain; the former Soviet Union and Germany are the major sources of acid pollution in Finland. In addition, soils and vegetation over large parts of the region were contaminated by radioactive fallout from the nuclear accident at Chernobyl, Ukraine, in 1986, affecting the major grazing areas for livestock and reindeer.

THE ENERGY DILEMMA

Environmental awareness in the region discourages the use of fossil fuels, primarily oil, which give off high levels of carbon dioxide when burned and contribute to global warming and other environmental ills. However, alternative sources of energy often have only limited potential or bring with them new environmental problems of their own. There is no easy solution. Nowhere is the dilemma more acute than in Sweden.

Hydroelectric power provides nearly half of Sweden's electricity production. However, most of the untapped potential is in the north of the country, far away from the main markets in the south, and grid links are expensive to build. Furthermore, the creation of reservoirs for hydroelectricity floods large areas of land, threatening the way of life of the seminomadic reindeer-herding Sami (Lapps) and destroying wildlife habitats. Opposition from environmental groups and the Sami themselves halted major hydroelectric development on four rivers – the Torne, Kalix, Pite and Vinde – in northern Sweden in the 1970s.

Nuclear power accounts for the other half of Sweden's electricity production, and is also opposed by environmentalists. The industry was developed in Sweden and Finland from the 1960s onward to reduce the heavy reliance on imported oil, used to fuel power stations and industry. However, public opposition increased in the wake of the Chernobyl nuclear disaster. Concerns had already been raised about safety and the disposal of nuclear waste, and in 1980 a referendum in Sweden resolved that no further reactors should be commissioned and that all existing reactors should be phased out by 2010. This will leave the country with a mounting energy crisis. Although it is developing both biofuel – produced from organic waste – and wind power programs, this will only go a small way to making good the shortfall in supply, and Sweden will have to rely on importing Danish or Norwegian natural gas to generate electricity.

LEADING THE WAY

Politicians and the public in all of the Nordic Countries are quick to identify local and global environmental problems and to take action to solve them. For example, Sweden has set itself the target of reducing sulfur emissions from the burning of fossil fuels to 35 percent of their 1980 level by 1995; Norway's goal is a 50 percent reduction by 1993, and Denmark and Finland are aiming for 50 percent by 1995. In contrast, most European and North American levels are set to fall to only 70 percent by 1993.

Steps have also been taken to develop renewable and nonpolluting sources of energy. Because Denmark is low-lying it is able to make considerable use of wind power. Clusters of three-sail windmills have been installed, mainly in Jutland, and many more are planned. There is potential for tidal power along the coasts of Denmark and Norway. Geothermal energy from volcanic springs is widely used in Iceland. Methane from farm waste and biofuels such as wood chips or pelleted domestic refuse are used to heat factories, greenhouses and homes in Denmark, and to a lesser extent Sweden and Finland. The burning of peat, traditionally used as a domestic fuel in Finland and Sweden, is actively discouraged. Conventional power station cooling systems provide hot water to heat apartment blocks and private houses in Denmark.

Curbing the car

The Nordic Countries were among the first to take effective measures to remedy the environmental problems posed by mass automobile ownership. Catalytic converters, which reduce by some 75 percent emissions of nitrogen oxides from gasoline-fueled engines – a major contributor to global warming – have been compulsory in all new automobile engines since 1989. They may only run on unleaded gasoline.

Since unleaded gasoline was first introduced into the Nordic Countries in the mid 1980s there has been a sharp fall in the amount of lead in the air. Samples taken from mosses in southern Norway, for example, show that lead levels in 1990 were about a third of those in 1977; cadmium levels also fell. A special tax on gasoline, with higher rates for leaded than unleaded, was introduced by the Norwegian government in 1991 to further reduce emissions and discourage car use.

A number of other measures have been put into effect to limit car use. These include the pedestrianization of many inner city shopping streets. In Copenhagen and Stockholm, severe city center parking restrictions have been imposed, and in some Norwegian cities, such as Bergen and Oslo, tolls have to be paid by vehicles using the city center streets. Modern, efficient public transportation systems are provided to encourage people to leave their automobiles at home.

Cleaning up the seas

With so much pollution coming to their shores from outside, all the countries of the region have played an active role in promoting international agreements to clean up the seas, often running ahead of their European neighbors. Three conferences on pollution in the North Sea, held between 1984 and 1990 by all the countries bordering its shores, set a target for halving the 1985 level of discharges of most toxic chemicals and nutrients by 1995, and for ending the dumping

A wind turbine in Sweden (*above*) is used to generate power as part of the country's attempt to become less dependent on nuclear energy and imported fossil fuels. Neighboring Denmark also has 3,000 wind turbines, mostly smallscale.

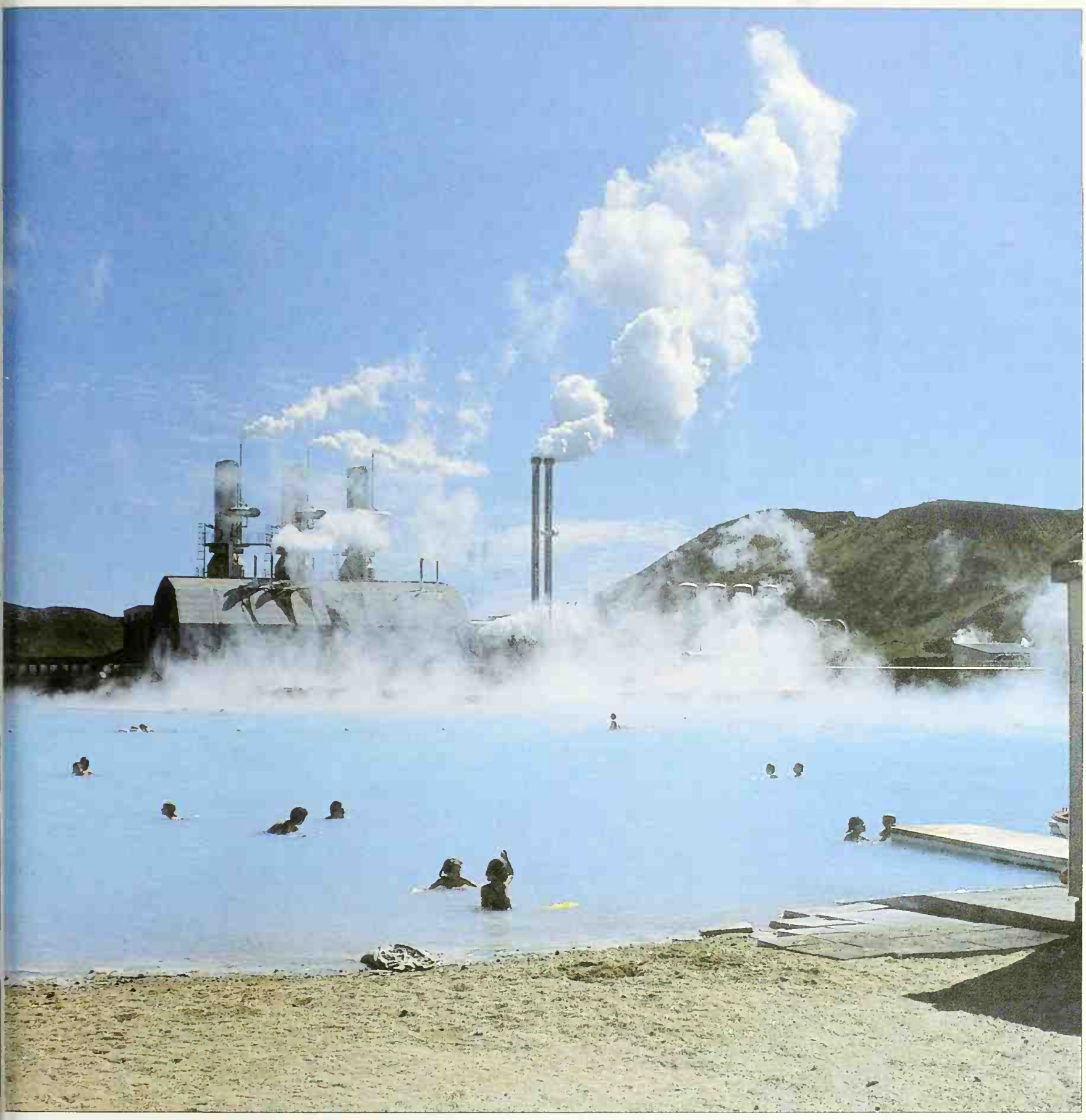
Hot water on tap (*right*) at a geothermal spring in Iceland. Bathers frolic in the naturally heated pool in close proximity to the "clean" power station in the background. Geothermal energy heats more than three-quarters of Iceland's households.

WASTE RECYCLING

The very high level of concern about environmental issues in the Nordic Countries is reflected in the efforts and time spent by ordinary individuals and the municipal authorities in recycling waste products, thereby reducing the amount of incineration and landfill required to dispose of domestic waste, and conserving resources. Glass, paper and aluminum are commonly recycled, and measures such as charging a small returnable sum of money on all glass bottles encourage reuse.

It is now a common practice in major cities such as Helsinki and Stockholm to sort household waste into different categories at home. The waste is collected as usual by the municipal authorities, but the presorting makes subsequent recycling a much easier process. Denmark has pioneered schemes to incinerate suitable domestic waste locally to fuel district heating systems. Items that present particular problems – batteries, for example, can leak heavy metals if not disposed of properly – can be returned to the store they were bought from for recycling or safe disposal.

To deter the dumping of old automobiles, a returnable deposit on vehicles in Norway is repaid when they are disposed of at a breaker's yard, while since 1975 the price of new Swedish vehicles has included a repayable scrapping fee. Manufacturers of automobiles and other products are increasingly using types of plastics that are suitable for recycling.



and incineration of hazardous industrial waste by 1994. However, the United Kingdom agreed only to halt dumping sewage sludge by 1998, and was alone in persisting with the dumping of radioactive waste. The 1988 Nordic Countries Action Plan to end marine pollution set earlier target dates and was much more wide-ranging.

Finland, Sweden and Denmark, with East and West Germany, Poland and the Soviet Union, were signatories in 1980 of the Helsinki Convention on the Protection of the Marine Environment of the Baltic Sea. The discharge of all hazardous chemicals and all dumping in the Baltic was banned, and limits were placed on other discharges. The pesticide DDT was banned, and the use of polychlorinated biphenyls (PCBs) – toxic organic compounds widely used as coolants and insulators – was strictly limited.

Action to reduce the pollution of rivers and seas is expensive, but governments and people are prepared to pay the costs. Norway, for example, targeted $5.6 billion in 1990 to improving methods of sewage and waste disposal and treating industrial and agricultural effluents. The large amounts to be spent on installing and monitoring industrial pollution controls may lower profits, reduce market share and even bankrupt some firms unless international competitors apply the same measures. Nevertheless, in 1988 Sweden ordered its pulp and paper industry – vital to the country's economy – to halve the chlorine pollutants used in the bleaching process.

A hidden poison

When sulfur dioxide (released when oil and coal are burned) or nitrogen oxides (from motor vehicle exhausts) react with oxygen and water vapor in the atmosphere they form acid rain – a sulfuric or nitric acid solution that can be carried over great distances before falling to earth as rain, snow, fog or mist, or as dry depositions or acid particles. As a result, soils, lakes, rivers and groundwater become acidified and poisoned.

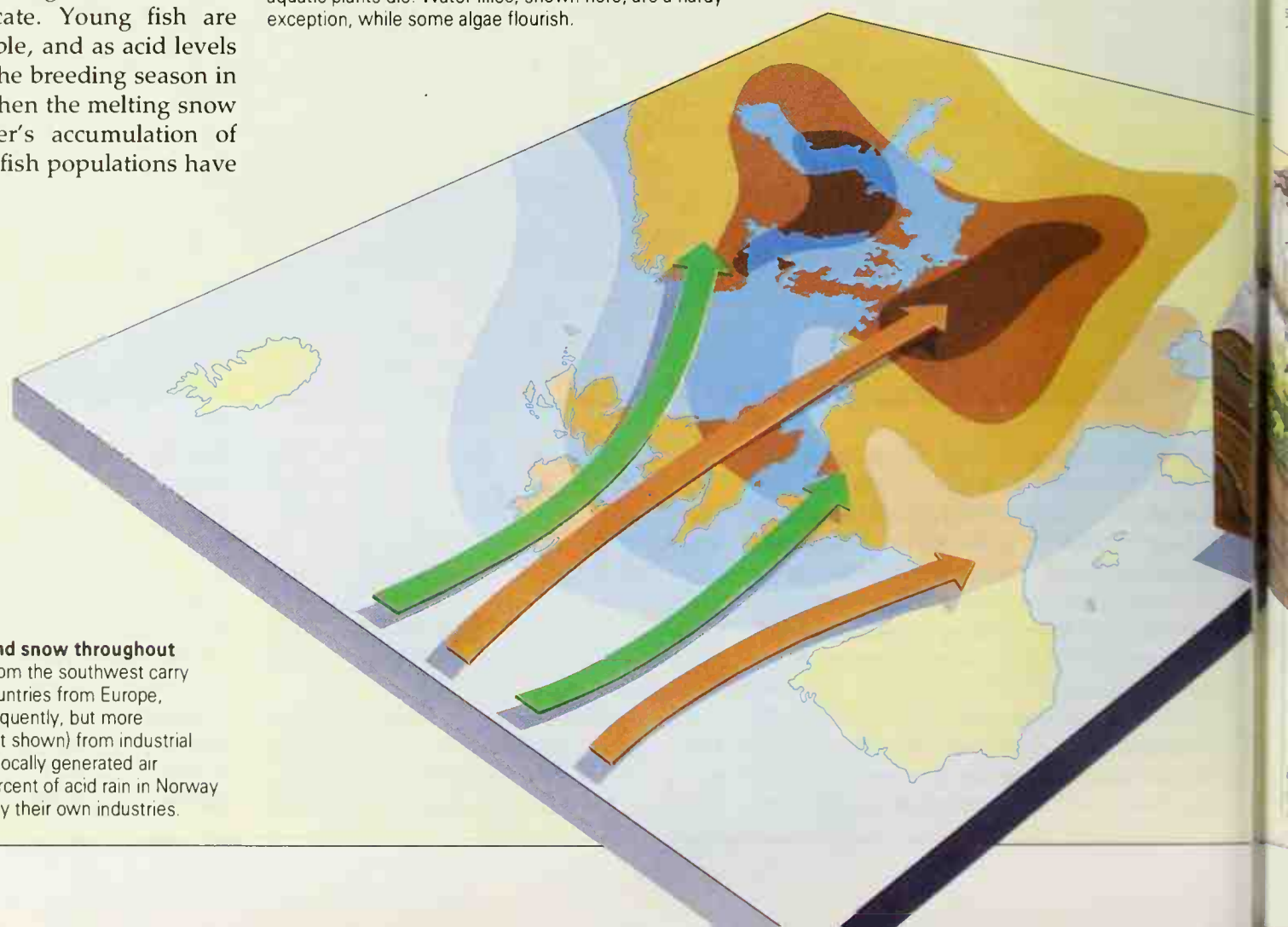
Most parts of the Nordic Countries are covered by thin, naturally acidic soils. By adding to the acid levels already present, acid rain leaches out nutrients and releases heavy metals in the soil, which drain into lakes and rivers. Soil in the worst affected parts of southern Sweden is up to 50 times more acid than it was 60, or even 30, years ago, and the store of nutrients has declined by up to a half since 1950. In urban areas acid rain damages buildings and corrodes drinking water pipes.

Dead lakes and dying forests

As the acid levels of lakes and rivers rise, increasing harm is done to fish and other aquatic life. Acid water disrupts the mechanisms by which fish maintain their balance of fluids and they lose body salts; aluminum damages the gills of fish, causing them to suffocate. Young fish are particularly vulnerable, and as acid levels are highest during the breeding season in the spring thaw – when the melting snow dissolves the winter's accumulation of acidic depositions – fish populations have been decimated.

Clear but toxic (*above*) Lake Hästevatten, an acidified lake on Sweden's west coast. Most of the region's lakes are underlain by granite, and so are naturally acidic. Others with limestone or sandstone beds are more resistant to acid fallout, due to alkaline bicarbonate being released from the rock. Most rock in Sweden, however, produces too little bicarbonate to prevent increased acidity from acid rain. Fish and most aquatic plants die. Water lilies, shown here, are a hardy exception, while some algae flourish.

What goes up must come down (*right*) Industrial aerial pollutants are distributed by the wind and converted into even more dangerous substances in the form of acid rain. Areas affected can be great distances from the sources of the pollutants.

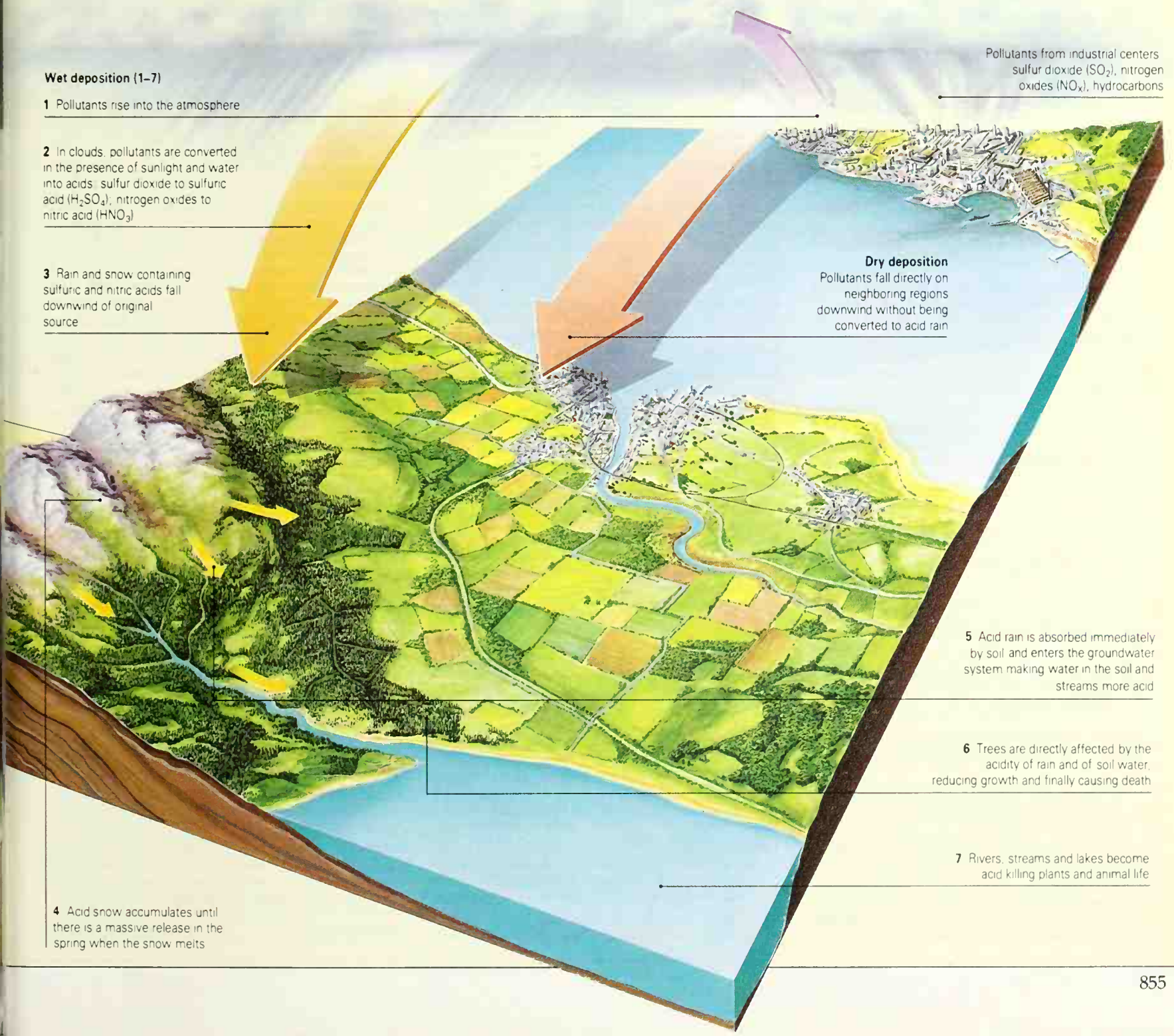


Average acidity of rain and snow throughout Europe Prevailing winds from the southwest carry pollutants to the Nordic Countries from Europe, particularly Britain. Less frequently, but more damagingly, light winds (not shown) from industrial Germany can bring severe locally generated air pollution. Only about 10 percent of acid rain in Norway and Sweden is generated by their own industries.

In southern Norway as early as 1921 some lakes were already found to be too acid for fish to survive; now, all the lakes and rivers in an 18,000 sq km (7,000 sq mi) area of southernmost Norway have lost nearly all their fish stocks and the problem is spreading up the west coast and inland. One-fifth of Sweden's 90,000 lakes and 10,000 km (6,200 mi) of rivers and streams are affected: 4,500 lakes have no fish life. Where fish do survive, they are often unfit to eat as they are contaminated by poisonous metals. Finland has no fish-dead lakes, but 500 lakes have become acid in recent decades.

Acid rain causes serious damage to forests by lowering soil fertility and releasing aluminum in soluble form, which harms tree roots. The crowns of the trees lose their density, there is needle loss, and eventually the trees die. In southwestern Sweden in the 1980s a fifth of middle-aged and mature spruce trees were found to have lost at least 20 percent of their needles, and similar damage was found in northern inland forests where soils are thin and poor. Pine trees in parts of Finland had suffered 10 percent loss. Only half of Norway's trees had full density crowns by 1988. Acidification also harms other forms of plant life, including food and fodder crops.

Attempts may be made to counteract water acidity by adding limestone to lakes and rivers. Sweden applies 200,000 tonnes of finely ground limestone annually. However, the cost is high and the process must be repeated every 2–5 years; moreover, liming does not stop the acidification of soils. The only long-term solution is to reduce levels of acid rain. The Nordic Countries have led the way in cutting sulfur and nitrogen emissions, but as most of the acid rain they receive originates outside the region, their actions will be of limited effect unless they can persuade countries responsible for the pollution to pursue the same policies.



GLOSSARY

Acid rain Rain or any other form of PRECIPITATION that has become more acid by absorbing waste gases (for example, sulfur dioxide and nitrogen oxides) discharged into the ATMOSPHERE.

Acid soil Soil that has a pH of less than 7; it is often PEATY.

Added value A higher price fetched by an article or RESOURCE after it has been processed. For example, crude oil has added value when it has been refined.

Agricultural economy An economy where most people work as cultivators or PASTORALISTS.

AIDS, Acquired Immune Deficiency Syndrome, a disease that damages the body's natural immune system and therefore makes people more susceptible to disease. The Human Immunodeficiency Virus (HIV) is the name given to one of the viruses that can lead to AIDS.

Air pollution The presence of gases and suspended particles in the air in high enough concentrations to harm humans, other animals, vegetation or materials. Such pollutants are introduced into the atmosphere principally as a result of human activity.

Alkaline soil Soil that has a pH of more than 7; chalk or limestone soils.

Alpine (1) A treeless ENVIRONMENT found on a mountain above the tree line but beneath the limit of permanent snow. (2) A plant that is adapted to grow in the TUNDRA-like environment of mountain areas.

Amphibian An animal that lives on land but whose life cycle requires some time to be spent in water, eg the frog.

Apartheid A way of organizing society to keep different racial groups apart. Introduced in South Africa by the National Party after 1948 as a means of ensuring continued white political dominance, it is now being dismantled.

Aquifer An underground layer of permeable rock, sand or gravel that absorbs and holds GROUNDWATER.

Arctic The northern POLAR region. In biological terms it also refers to the northern region of the globe where the mean temperature of the warmest month does not exceed 10°C (50°F). Its southern boundary roughly follows the northern tree line.

Arid (of the climate) Dry and usually hot. Arid areas generally have less than 250 mm (10 inches) of rain a year. Rainfall is intermittent and quickly evaporates or sinks into the ground. Little moisture remains in the soil, so plant life is sparse.

Atmosphere The gaseous layer surrounding the Earth. It consists of nitrogen (78 percent), oxygen (21 percent), argon (1 percent), tiny amounts of carbon dioxide, neon, ozone, hydrogen and krypton, and varying amounts of water vapor.

Atoll A circular chain of CORAL reefs enclosing a lagoon. Atolls form as coral reefs fringing a volcanic island; as sea levels rise or the island sinks a lagoon is formed.

Autonomy The condition of being self-governing, usually granted to a subdivision of a larger STATE or to a territory belonging to it.

Balance of payments A statement of a country's transactions with all other countries over a given period.

Balance of power A theory of political stability that is based upon an even distribution of power among the leading STATES.

Basalt A fine-grained IGNEOUS ROCK. It has a dark color and contains little silica. Ninety percent of lavas are basaltic.

Bible The book of scriptures of CHRISTIANITY and JUDAISM. The Jewish Bible contains many books in common with the Christian version describing historical events and prophetic teachings, but the latter also includes accounts of the life and teachings of Jesus Christ.

Biodegradable (of a substance) easily broken down into simpler substances by bacteria or other decomposers. Products made of organic materials such as paper, woolens, leather and wood are biodegradable; many plastics are not.

Biodiversity The number of different species of plants and animals found in a given area. In general, the greater the number of species, the more stable and robust the ECOSYSTEM is.

Biomass The total mass of all the living organisms in a defined area or ECOSYSTEM.

Biosphere The thin layer of the Earth that contains all living organisms and the ENVIRONMENT that supports them.

Biotechnology Technology applied to biological processes, including genetic engineering, the manipulation of the genetic makeup of living organisms.

Birthrate The number of births expressed as a proportion of a population. Usually given as the annual number of live births per 1,000 population (also known as the crude birthrate).

Black economy The sector of the economy that avoids paying tax.

Bloc A group of countries closely bound by economic and/or political ties.

Boreal Typical of the northern climates lying between the ARCTIC and latitude 50°N, characterized by long cold winters and short summers. Vegetation in these regions is dominated by BOREAL FOREST.

Boreal forest The name given to the CONIFEROUS FORESTS or TAIGA of the northern hemisphere.

Brown coal A peat-like material, also known as lignite, which is an immature form of coal. It has a lower energy value than more mature forms of coal.

Buddhism A religion founded in the 6th and 5th centuries BC and based on the teachings of Siddhartha Gautama; it is widely observed in southern and Southeast Asia.

Bureaucracy The body of STATE officials that carry out the day-to-day running of government. It may also refer to a system of administration marked by the inflexible application of rules.

Capital Variously refers to machinery, investment funds or a particular employment relationship involving waged labor.

Capitalism A political and economic system based on the production of goods and services for profitable exchange in which labor itself is bought and sold for wages. Capitalist economies can be more or less regulated by governments. In a capitalist mixed economy the government will own some of the country's utilities and industries as nationalized companies. It will also act as a major employer of labor.

Cash crop A crop grown for sale rather than for SUBSISTENCE.

Caste (1) (among people) A system of rigid hereditary social divisions, normally associated with the Hindu caste system in India, where an individual is born into the caste of his or her parents, must marry within it, and cannot leave it. (2) (among insects) A system within a single colony where there are different types of functional individual, usually distinguished by morphology, age and/or sex. For example, queens, workers and drones are distinct castes within a beehive.

Caucasian (1) A racial classification based on white or light skin color. (2) An inhabitant of the Caucasus region or the Indo-European language of this people.

Cereal A cultivated grass that has been selectively bred to produce high yields of edible grain for consumption by humans and livestock. The most important are wheat (*Triticum*), rice (*Oryza saliva*) and maize (*Zea mays*).

CFCs (chlorofluorocarbons) Organic compounds made up of atoms of carbon, chlorine and fluorine. Gaseous CFCs used as aerosol propellants, refrigerant gases and solvent cleaners are known to cause depletion of the OZONE LAYER.

Christianity A religion based on the teachings of Jesus Christ and originating in the 1st century AD from JUDAISM. Its main beliefs are found in the BIBLE and it is now the world's most widespread religion, divided into a number of churches and sects, including Roman Catholicism, Protestantism and Orthodox churches.

CITES (Convention on International Trade in Endangered Species) An international agreement signed by over 90 countries since 1973. SPECIES (FAUNA and FLORA) placed in Appendix I of CITES are considered to be in danger of EXTINCTION, and trade is prohibited without an export permit. Signatory countries have to supply data to the World Conservation Union, which monitors IMPORTS and EXPORTS. Appendix II species could be threatened with extinction if trade is not regulated.

City-state An independent STATE consisting of a single city and the surrounding countryside needed to support it. Singapore is an example of a modern city-state.

Class (1) A group of people sharing a common economic position, for example large landowners, waged-laborers or owners of small businesses. (2) (in zoology and botany) A rank in the taxonomic hierarchy coming between phylum and order. See CLASSIFICATION.

Classification A system of arranging the different types of living organisms according to the degree of similarity of their inherited characteristics. The classification system enables organisms to be identified and may also reveal the relationships between different groups. The internationally accepted classification hierarchy groups organisms first into divisions, then phyla, CLASSES, orders, FAMILIES, GENERA, SPECIES and SUBSPECIES.

Cocoa One of the ingredients of chocolate, cocoa is derived from cocoa beans, which are the seeds of the cacao tree (*Theobroma cacao*). They are found in yellowish pods that grow directly from the trunk. The tree is native to tropical America, but is cultivated mainly in west Africa.

Collectivization The organization of an economy (typically communist) by collective control through agencies of the state. See COMMUNISM.

Colonialism The political practice whereby a foreign country is occupied for settlement and economic exploitation.

Colony (1) A territory under the sovereignty of a foreign power. (2) (in zoology) A group of individual animals or plants that are physiologically connected to each other. (3) A distinct localized population of animals, for example termites, seabirds etc.

COMECON The Council for Mutual Economic Assistance, formed in 1947 as an organization to further trade and economic cooperation between communist countries. It had 10 members before its collapse in 1989 – the Soviet Union, Bulgaria, Czechoslovakia, Hungary, Poland, Romania, East Germany, Mongolia, Cuba, and Vietnam.

Commonwealth A loose association of STATES that are former members of the British EMPIRE with the British monarch at its head.

Communism A social and economic system based on the communal ownership of property. It usually refers to the state-controlled social and economic systems in the former Soviet Union and Soviet-bloc countries and in the People's Republic of China. See SOCIALISM.

Coniferous forest A forest of mainly coniferous, or cone-bearing trees, frequently with evergreen needle-shaped leaves and found principally in the TEMPERATE ZONES and BOREAL regions. The timber they produce is known as SOFTWOOD.

Conservation The use, management and protection of NATURAL RESOURCES so that they are not degraded, depleted or wasted and in order to maintain their sustainable use and ecological diversity. See SUSTAINABILITY.

Constitution The fundamental statement of laws that defines the way in which a country is governed.

Consumer goods Goods that are acquired for immediate use, such as foodstuffs, radios, televisions and washing machines.

Continental climate The type of climate associated with the interior of continents. It is characterized by wide daily and seasonal ranges of temperature, especially outside the TROPICS, and by low rainfall.

Continental drift The theory that today's continents, formed by the breakup of prehistoric supercontinents, have slowly drifted to their present positions. The theory was first proposed by Alfred Wegener in 1912.

Continental shelf An extension of a continent, forming a shallow, sloping shelf covered by sea.

Convention on International Trade in Endangered Species. See CITES.

Coral A group of animals related to sea anemones and living in warm seas. Individuals, called polyps, combine to form a COLONY.

Council for Mutual Economic Assistance See COMECON.

Culture (1) The beliefs, customs and social relations of a people. (2) The assumptions that a people makes in interpreting the world around them.

Cyclone A center of low atmospheric pressure. Tropical cyclones are known as HURRICANES or typhoons.

Dead lake (or **Dead river**) An area of water in which dissolved oxygen levels have fallen as a result of acidification, overgrowth of plants, or high levels of pollution to the extent that few or no living things are able to survive.

Debt The financial obligations owed by a country to the rest of the world, usually repayable in US dollars. Total external debt includes public, publicly guaranteed, and private long-term debt.

Deciduous (of plants, trees, a forest etc) dropping their leaves in the winter or in the dry season.

Decolonization The transfer of government from a colonial power to the people of the COLONY at the time of political independence.

Deforestation The felling of trees and clearing of forested land, which is then converted to other uses.

Delayed runoff See RUNOEE.

Delta A large accumulation of sediment, often fan-shaped, deposited where a river enters the sea or a lake. The flow of the river slows down on entering calmer waters and it is not able to transport the sediment it carries. Often the flow of the river splits into many channels, known as distributaries, creating new routes for the water and its load.

Democracy A form of government in which policy is made by the people (direct democracy) or on their behalf (indirect democracy). Indirect democracy usually takes the form of competition among political parties at elections.

Desert A very ARID area with less than 25 cm (10 in) rainfall a year. In hot deserts the rate of evaporation is greater than the rate of PRECIPITATION, and there is little vegetation.

Desertification The creation of desert-like conditions usually caused by a combination of overgrazing, soil EROSION, prolonged DROUGHT and climate change.

Developed country Any country characterized by high standards of living and a sophisticated economy, particularly in comparison to DEVELOPING COUNTRIES. A number of indicators can be used to measure a country's wealth and material well-being: for example, the GROSS NATIONAL PRODUCT, the PER CAPITA consumption of energy, the number of doctors per head of population and the average life expectancy.

Developing country Any country that is characterized by low standards of living and a SUBSISTENCE economy. Sometimes called THIRD WORLD countries, they include most of Africa, Asia and Central and South America.

Dictator A leader who concentrates the power of the STATE in his or her own hands.

Divide see WATERSHED.

Dominant species The most numerous or prevailing SPECIES in a community of plants or animals.

Dormancy A period during which the metabolic activity of a plant or animal is reduced to such an extent that it can withstand difficult environmental conditions such as cold or drought.

Drought An extended period in which rainfall is substantially lower than average and the water supply is insufficient to meet demand.

EC See EUROPEAN COMMUNITY

Ecology (1) The study of the interactions of living organisms with each other and with their ENVIRONMENT. (2) The study of the structure and functions of nature.

Ecosystem A community of plants and animals and the ENVIRONMENT in which they live and react with each other.

Effluent Any liquid waste discharged into the ENVIRONMENT as a byproduct of industry, agriculture or sewage treatment.

Emission A substance discharged into the air in the form of gases and suspended particles, from automobile engines and industrial smokestacks, for example.

Empire (1) A political organization of STATES and territories in which one dominates the rest. (2) The territory that constitutes such a group of states.

Endangered species A SPECIES whose population has dropped to such low levels that its continued survival is insecure.

Endemic species A SPECIES that is native to one specific area, and is therefore often said to be characteristic of that area.

Environment (1) The external conditions – climate, geology and other living things – that influence the life of individual organisms or ECOSYSTEMS. (2) The surroundings in which all animals and plants live and interact with each other.

Erosion The process by which exposed land surfaces are broken down into smaller particles or worn away by water, wind or ice.

Ethnic group A group of people sharing a social or cultural identity based on language, religion, customs and/or common descent or kinship.

European Community (EC) an alliance of western European nations formed to agree common policies in the areas of trade, aid, agriculture and economics. The six founder members in 1957 were France, West Germany, Belgium, Holland, Luxembourg and Italy. A further three – Britain, Ireland and Denmark – joined in 1973, Greece in 1981 and Spain and Portugal in 1986. East Germany became a member when it was reunited with West Germany in 1990.

Evolution The process by which SPECIES develop their appearance, form and behavior through the process of NATURAL SELECTION, and by which new species or varieties are formed.

Exotic (of an animal or plant) Not native to an area but established after being introduced from elsewhere, often for commercial or decorative purposes.

Exports Goods and services sold to other countries, bringing in foreign exchange.

Extinction The loss of a local population of a particular SPECIES or even the entire species. It may be natural or be caused by human activity.

Family A taxonomic term for a group of related plants or animals. For example, the family Felidae (cat family) includes the lion, the tiger and all the smaller cats. Most families contain several GENERA, and families are grouped together into orders. See CLASSIFICATION.

Famine An acute shortage of food leading to widespread malnutrition and starvation.

Fault A fracture or crack in the Earth along which there has been movement of the rock masses.

Fauna The general term for the animals that live in a particular region.

Feudalism (1) A type of society in which landlords collect dues from the agricultural producers in return for military protection. (2) A hierarchical society of mutual obligations that preceded CAPITALISM in Europe.

First World A term sometimes used to describe the advanced industrial countries.

Fjord A steep-sided inlet formed when a glaciated U-shaped valley is drowned by the sea. See GLACIATION.

Flora (1) The general term for the plant life of a particular region. (2) A book that lists and describes the plants of a given area.

Fossil fuel Any fuel, such as coal, oil and NATURAL GAS, formed beneath the Earth's surface under conditions of heat and pressure from organisms that died millions of years ago.

Free trade A system of international trade in which goods and services are exchanged without TARIFES, QUOTAS or other restrictions.

GATT The General Agreement on Tariffs and Trade, a treaty that governs world imports and exports. Its aim is to promote FREE TRADE, but at the moment many countries impose TARIFF barriers to favor their own industries and agricultural produce.

GDP See GROSS DOMESTIC PRODUCT.

Genus (pl. **genera**) A level of biological CLASSIFICATION of organisms in which closely related SPECIES are grouped. For example, dogs, wolves, jackels and coyotes are all grouped together in the genus *canis*.

Ghetto A slum area in a city that is occupied by an ETHNIC minority. The word originally referred to the part of a city in medieval Europe to which Jews were restricted by law.

Glaciation (1) The process of GLACIER and ice sheet growth. (2) The effect of these on the landscape.

Glacier A mass of ice formed by the compaction and freezing of snow and which shows evidence of past or present movement.

Global warming The increase in the average temperature of the Earth that is believed to be caused by the GREENHOUSE EEEECT.

GNP See GROSS NATIONAL PRODUCT.

Greenhouse effect The effect of certain gases in the ATMOSPHERE, such as carbon dioxide and METHANE, in absorbing solar heat radiated back from the surface of the Earth and preventing its escape into space. Without these gases the Earth would be too cold for living things, but the burning of FOSSIL EUELS for industry and transportation has caused atmospheric levels of these gases to increase, and this is believed to be a cause of GLOBAL WARMING.

Green Revolution The introduction of high-yielding varieties of seeds (especially rice and wheat) and modern agricultural techniques to increase agricultural production in DEVELOPING COUNTRIES. It began in the early 1960s.

Gross Domestic Product (GDP) The total value of a country's annual output of goods and services, with allowances being made for depreciation. Growth in GDP is usually expressed in constant prices, to offset the effects of inflation. GDP is a

very useful guide to the level of economic activity in a country.

Gross National Product (GNP) A country's GROSS DOMESTIC PRODUCT plus income from abroad.

Groundwater Water that has percolated into the ground from the Earth's surface, filling pores, cracks and fissures. An impermeable layer of rock prevents it from moving deeper so that the lower levels become saturated. The upper limit of saturation is known as the WATER TABLE.

Growing season The period of the year when the average temperature is high enough for plants to grow. It is longest at low latitudes and altitudes. Most plants can grow when the temperature exceeds 5°C (42°F).

Habitat The external ENVIRONMENT to which an animal or plant is adapted and in which it prefers to live, usually defined in terms of vegetation, climate or altitude – eg grassland habitat.

Hard currency A currency used by international traders because they think it is safe from devaluation.

Hardwood Any timber from broadleaf trees such as oak, ash and beech. Hardwoods are generally stronger and less likely to rot than wood from cone-bearing trees, which is known as SOFTWOOD.

Hinduism A body of religious practices, originating in India in the 2nd millennium BC, that emphasizes ways of living rather than ways of thought. Its beliefs and practices are based on the Vedas and other scriptures and are closely intertwined with the culture of the people of India.

HIV (Human Immunodeficiency Virus) See AIDS.

Hunter–gatherers People who obtain their food requirements by hunting wild animals and gathering the berries and fruits from wild plants.

Hurricane A tropical CYCLONE, usually found in the Caribbean and western North Atlantic.

Hybrid An animal or plant that is the offspring of two genetically different individuals. Hybrid crops are often grown because they give higher yields and are more resistant to disease.

Ice age A long period of geological time in which the temperature of the Earth falls and snow and ice sheets are present throughout the year in mid and high latitudes. There have been many ice ages in the Earth's history.

Igneous rock Rock formed when magma (molten material within the Earth's crust) cools and solidifies.

Imperialism The process whereby one country forces its rule on another country, frequently in order to establish an EMPIRE.

Imports Goods and services purchased from other countries.

Import substitution industry Any industry that has been set up (mainly in THIRD WORLD countries) to manufacture products that used to be imported. Import substitution industries are normally simple ones with an immediate local market such as the manufacture of cigarettes, soap and textiles. They are protected during their start-up phase by high TARIFFS on foreign rivals.

Indigenous peoples The original inhabitants of a region, generally leading a traditional way of life.

Islam A religion based on the revelations of God to the prophet Muhammed in the 7th century AD, which are contained in the Qu'ran. Islam is widely practiced throughout North Africa, the Indian Subcontinent, the Middle East and parts of Southeast Asia.

Judaism A religion founded in 2000 BC among the ancient Hebrews and practiced by Jews; it is monotheistic (believing in a single God) and its main beliefs are contained in the BIBLE.

Jute (*Corchorus capsularis* or *C. olitorius*) A fiber crop cultivated in Asia, used to make ropes, sacks, hessian, carpet backing and tarpaulin.

Labor force The economically active population, including the armed forces and the unemployed. Full-time homemakers and unpaid caregivers are not included.

Leaching The process by which water washes nutrients and minerals downward from one layer of soil to another, or into streams.

Left-wing A general term to denote antiestablishment political views, specifically used as a label for socialist or communist parties. See COMMUNISM, SOCIALISM.

Legislature The branch of government responsible for enacting laws.

Limestone A sedimentary rock formed under the sea and consisting mainly of calcium carbonate. It is used as a building stone and in the manufacture of cement.

Literacy Usually defined as the ability to read and write a simple sentence.

Low income economy The poorest countries in the world, where the average PER CAPITA income was between $610 and $2,565 in 1990.

Mammal A vertebrate animal belonging to the CLASS Mammalia, having a four-chambered heart, fur or hair, and feeding its young on milk secreted by the mammae (nipples). With the exception of monotremes, mammals do not lay eggs, but give birth to live young.

Mangrove A dense forest of shrubs and trees growing on tidal coastal mudflats and estuaries throughout the tropics.

Maquis The typical vegetation of the Mediterranean coast, consisting of aromatic shrubs, laurel, myrtle, rock rose, broom and small trees such as olive, fig and holm oak.

Maritime climate A generally moist climate, determined mainly by proximity to the sea. The sea heats up and cools down more slowly than the land, reducing variations in temperature so that the local climate is more equable than farther inland.

Market economy An economy in which most economic activities are transacted by private individuals and firms in largely unregulated markets.

Marxism The system of thought derived from the 19th-century political theorist Karl Marx, in which politics is interpreted as a struggle between economic CLASSES. It promotes communal ownership of property when it is practiced, so is popularly known as COMMUNISM.

Mediterranean climate Any climate similar to that of the Mediterranean region: wet winters and hot, dry summers.

Methane A gas produced by decomposing organic matter that burns without releasing pollutants and can be used as an energy source. Excessive methane production from vast amounts of animal manure is believed to contribute to the GREENHOUSE EFFECT.

Migrant workers Part of the LABOR FORCE which has come from another country, or another part of the same country, looking for temporary employment.

Monetarism An economic philosophy that sees inflation as the main menace to economic growth and proposes a direct relationship between the rate of growth of the money supply of a country and its subsequent rate of inflation.

Monsoon (1) The wind systems in the TROPICS that reverse their direction according to the seasons; when they blow onshore they bring heavy rainfall. (2) The rain caused by these winds.

Montane The zone at middle altitudes on the slopes of mountains, below the ALPINE zone.

Nation A community that believes it consists of a single people, based upon historical and cultural criteria and sharing a common territory. Sometimes used interchangeably with STATE.

Nationalism An ideology that assumes all NATIONS should have their own STATE, a NATION-STATE, in their own territory, the national homeland.

Nation-State A STATE in which the inhabitants all belong to one NATION. Most states claim to be nation-states; in practice almost all of them include minority groups.

Natural gas A FOSSIL FUEL in the form of a flammable gas that occurs naturally in the Earth. It is often found in association with deposits of petroleum.

Natural resources RESOURCES created by the Earth's natural processes including mineral deposits, FOSSIL FUELS, soil, air, water, plants and animals. Most natural resources are harvested by people for use in agriculture, industry and economic activities.

Natural selection The process by which organisms not well suited to their ENVIRONMENT are eliminated by predation, parasitism, competition, etc, and those that are well suited survive to breed and pass on their genes to the next generation.

Nomad A member of a (usually pastoral) people that moves seasonally from one place to another in search of food, water or pasture for their animals. See PASTORALIST.

Nonrenewable resource A NATURAL RESOURCE that is present in the Earth's makeup in finite amounts (coal, oil etc) and cannot be replaced once reserves are exhausted.

OECD (Organization for Economic Cooperation and Development) An organization set up in 1961 to promote the economic growth of its (now 24) rich member countries.

One-party system A political system in which there is no competition to the government PARTY at elections (eg communist and military regimes) and all but the government party is banned.

OPEC The Organization of Petroleum Exporting Countries, a cartel that represents the interests of 11 of the chief petroleum exporting countries. It is able to exercise a degree of control over the price of their product.

Ozone layer A band of enriched oxygen or ozone found in the upper ATMOSPHERE. It absorbs harmful ultraviolet radiation from the Sun. The heat this creates provides a cap for the earth's weather systems.

Pangea The supercontinent that was composed of all the present-day continents and therefore included both Gondwanaland and Laurasia. It existed between 250 and 200 million years ago. See also CONTINENTAL DRIFT.

Parasite An organism that lives on or in another organism of a different SPECIES and derives nutrients from it, giving nothing beneficial in return.

Parliamentary democracy A political system in which the LEGISLATURE (parliament) is elected by all the adult members of the population and the government is formed by the PARTY that commands a majority in the parliament.

Party An organized group seeking political power to implement an agreed set of policies.

Pastoralist A person following a way of life based on tending herds of animals such as sheep, cattle, goats or camels; often NOMADIC, it involves moving the herds according to the natural availability of pasture and water.

Peat Soil formed by an accumulation of plant material incompletely decomposed due to low temperature and lack of oxygen, usually as a result of WATERLOGGING.

Per capita Per head.

Permafrost Soil and rock that remains permanently frozen, typically in the POLAR REGIONS. A layer of soil at the surface may melt in summer, but the water that is released is unable to drain away through the frozen subsoil and refreezes in colder conditions.

Pesticide Any chemical substance used to control the pests that can damage crops, such as insects and rodents. Often used as a general term for herbicides, insecticides and fungicides.

pH A measurement on the scale 0–14 of the acidity or alkalinity of a substance.

Plateau A large area of level, elevated land. When bordered by steep slopes it is called a tableland.

Polar regions The regions that lie within the lines of latitude known as the ARCTIC and Antarctic circles, respectively 66°32′ north and south of the Equator. At this latitude the sun does not set in midsummer nor rise in midwinter.

Polder An area of level land at or below sea level obtained by land reclamation. It is normally used for agriculture.

Poverty line A measure of deprivation that varies from country to country. In LOW-INCOME ECONOMIES the poverty referred to is an absolute poverty, where a certain percentage of the population lacks sufficient food to eat and resources to provide for shelter. In the advanced industrial world people are often considered to be in poverty if they earn less than 60 percent of the average wage. Their basic needs will be met by local welfare systems but they suffer poverty relative to their compatriots.

Prairie The flat grassland in the interior of North America between 30°N and 55°N, much of which has been plowed and is used to grow cereal crops.

Precipitation Moisture that reaches the Earth from the ATMOSPHERE, including mist, dew, rain, sleet, snow and hail.

Predator An animal that feeds on another animal (the PREY).

President A head of state, elected in some countries directly by the voters and in others by members of the LEGISLATURE. In some political systems the president is chief executive, in others the office is largely ceremonial.

Prey An animal that a PREDATOR hunts and kills for food.

Productivity (1) A measure of economic output in relation to the quantity of economic inputs (labor, machines, land, etc) needed for production. (2) The amount of weight (or energy) gained by an individual, a SPECIES or an ECOSYSTEM per unit of area per unit of time.

Quota A limit imposed on the amount of a product that can be imported in a given time.

Radioactivity The emission of alpha-, beta- and gamma particles from atomic nuclei. This is greatest when the atom is split, as in a nuclear reactor. Prolonged exposure to radioactive material can cause damage to living tissue, leading to cancers and ultimately death.

Rainforest Forest where there is abundant rainfall all year round and no dry season. The term is often associated with tropical rainforests, where growth is lush and very rapid, but there are also rainforests in TEMPERATE ZONES. Rainforests probably contain half of all the Earth's plant and animal species.

Refuge A place where a SPECIES of plant or animal has survived after formerly occupying a much larger area. For example, mountain tops are refuges for ARCTIC species left behind as the GLACIERS retreated at the end of the last ICE AGE.

Resource Any material, source of information or skill that is of economic value to industry and business.

Roman empire An EMPIRE founded in the year 27 BC from the Roman Republic, which began about 500 BC in present-day Italy. At its height it controlled the Mediterranean, large parts of western Europe and the Middle East. In the 5th century it divided, the eastern half becoming the Byzantine empire.

Runoff Water produced by rainfall or melting snow that flows across the land surface into streams and rivers. Delayed runoff is water that soaks into the ground and later emerges on the surface as springs.

Salinization The accumulation of soluble salts near or at the surface of soil, caused by an arid climate. Salinization can also occur when water used for irrigation evaporates; eventually the land becomes so salty that it is worthless for cultivation.

Savanna A HABITAT of open grassland with scattered trees in tropical and subtropical areas. There is a marked dry season and too little rain to support large areas of forest.

Second World A term sometimes used to describe the developed socialist countries (including the former Soviet Union and former Soviet bloc).

Semiarid land Any area between an ARID desert and a more fertile region where there is sufficient moisture to support a little more vegetation than can survive in the DESERT. Also called semidesert.

Separatism A political movement in a STATE that supports the secession of a particular minority group, within a defined territory, from that state.

Service industries Industries that supply services to customers or to other sectors of the economy; typically banking, transport, insurance, education, healthcare, retailing and distribution.

Shanty town An area of very poor housing consisting of ramshackle huts and other simple dwellings often made from waste materials and with inadequate services.

Shifting cultivation A method of farming prevalent in tropical areas in which a piece of land is cleared and cultivated until its fertility is diminished. The farmer then abandons the land, which restores itself naturally.

Slash-and-burn farming A method of farming in tropical areas where the vegetation cover is cut and burned to fertilize the land before crops are planted. Often a feature of SHIFTING CULTIVATION.

Socialism An economic system and political ideology based upon the principle of equality between people, the redistribution of wealth and property and equal access to benefits such as healthcare and education.

Softwood The wood from coniferous trees.

Solar energy The radiant energy produced by the Sun that powers all the Earth's natural processes. It can be captured and used to provide domestic heating or converted to produce electrical energy.

Specialization (in natural history) The evolutionary development of a SPECIES, leading to narrow limits of tolerance and a restricted role (or niche) in the community.

Species The basic unit of CLASSIFICATION of plants and animals. Species are grouped into GENERA and variations may be categorized into SUBSPECIES in descending order of hierarchy.

State The primary political unit of the modern world, usually defined by its possession of sovereignty over a territory and its people.

Steppe An open grassy plain with few trees or shrubs. Steppe is characterized by low and sporadic rainfall, and experiences wide variations in temperature during the year.

Subsistence A term applied to systems in which producers can supply their own needs for food, shelter, etc but have little or no surplus to trade.

Subspecies A rank in the CLASSIFICATION of plants and animals between SPECIES and variety. It is often used to denote a geographical variation of a species.

Subtropical The climatic zone between the TROPICS and TEMPERATE ZONES. There are marked seasonal changes of temperature but it is never very cold.

Succession The development and maturation of an ECOSYSTEM, through changes in the types and abundance of SPECIES. When it reaches maturity it stabilizes in a climax.

Sustainability The concept of using the Earth's NATURAL RESOURCES to improve people's lives without diminishing the ability of the Earth to support life today and in the future.

Tableland See PLATEAU.

Taiga The Russian name given to the CONIFEROUS FOREST and PEATland belt that stretches around the world in the northern hemisphere, south of the TUNDRA and north of the DECIDUOUS forests and grasslands.

Tariff A tax imposed on imported goods or services.

Taxonomy The scientific CLASSIFICATION of organisms.

Temperate zone Any one of the climatic zones in mid latitudes, with a mild climate. They cover areas between the warm TROPICS and cold POLAR REGIONS.

Terrestrial (of a plant, animal etc) spending its entire life cycle on the land.

Third World A term first used to refer to ex-COLONIES that were neither fully capitalist (FIRST WORLD) nor fully socialist (SECOND WORLD). Now used to refer to the poorer, less industrialized countries of the developing world.

Tribe A group of people united by a common language, religion, customs and/or descent and kinship; often used to describe the social groups of peoples who have no developed STATE or government and whose social organization is based on ancestry and extended family systems.

Tropics The area of the Earth lying between the Tropic of Cancer (23°30′ N) and the Tropic of Capricorn (23°30′ S). They mark the lines of latitude farthest from the Equator where the Sun is still found directly overhead at midday in midsummer.

Tundra The level, treeless land lying in the very cold northern regions of Europe, Asia and North America, where winters are long and cold and the ground beneath the surface is permanently frozen. See also PERMAFROST.

Upper-middle-income economy Any country where average PER CAPITA income was between $2,566 and $7,619 in 1990.

Urbanization (1) The process by which the proportion of a country's population living in towns or cities grows, while the rural population diminishes. (2) The process of city formation and growth.

Water table The uppermost level of underground rock that is permanently saturated with GROUNDWATER.

Waterlogging The complete saturation of land by water.

Watershed The boundary line dividing two river systems. It is also known as a water-parting or divide, particularly in the United States, where the word watershed refers to a river basin (the area drained by a river and its tributaries).

Welfare State A social and economic system based on STATE provision of, and responsibility for, such things as healthcare, pensions and unemployment benefit. These services are financed by general contributions from the working population, and access is intended to be equally available to all, free of charge. It originated in Britain at the start of the 20th century and became widespread in Europe after World War II.

Wetlands A HABITAT that is waterlogged all or enough of the time to support vegetation adapted to these conditions.

INDEX

Page numbers in **bold** refer to extended treatment of topic; in *italics* to captions, maps or tables

M

N

O

P

Q

R

S

Acknowledgments

CONTRIBUTORS

General Advisory Editor
Professor Peter Haggett, University of Bristol, UK

COUNTRY PROFILES

Advisory Editor
Dr Kurt Viking Abrahamsson, University of Umëa. Sweden

Writers
Asgard Publishing Services:
Philip Gardner
Allan Scott
Michael Scott Rohan
Andrew Shackleton

REGIONAL PROFILES

Advisory Editors

Professor Ken J. Gregory, Goldsmith's College, London, UK
Physical Geography

Robert Burton, Huntingdon, UK
Habitats and their Conservation, Animal Life

Professor D.M. Moore, University of Reading, UK
Plant Life

Dr John Tarrant, University of East Anglia, UK
Agriculture

Dr Ian Hamilton, London School of Economics, UK
Industry

Dr Stuart Corbridge, University of Cambridge, UK
Economy

Dr Alisdair Rogers, University of Oxford, UK
Peoples and Cultures

Professor John Rennie Short, Syracuse University, USA
Cities

Dr Peter Taylor, University of Newcastle upon Tyne, UK
Government

Dr Michael Williams, University of Oxford, UK
Environmental Issues

Writers

Professor Ken J. Gregory, Goldsmith's College, London, UK
Physical Geography

Dr Claes Grundsten, The National Swedish Environmental Protection Board, Solna, Sweden *Habitats and their Conservation*

Elizabeth Bomford, Hereford, UK
Animal Life

Professor John Packham, University of Wolverhampton, UK
Plant Life

Professor W.R. Mead, University College London, UK
Agriculture, Cities

Dr Claes Alvstam, Gothenburg University, Sweden
Industry

Dr Gerard Kearnes, University of Wisconsin, USA
Economy

Finn Rindom Madsen, Institute of Ethnography and Social Anthropology, Aarhus, Denmark *Peoples and Cultures*

Dr Brian Fullerton, University of Newcastle upon Tyne, UK
Government

Dr Richard Knowles, University of Salford, UK
Environmental Issues

Editorial Director: Graham Bateman
Project Editors: Susan Kennedy, Candida Hunt
Series Editors: Victoria Egan, Fiona Mullan
Art Editor: Steve McCurdy
Chief Designer: Chris Munday
Cartographic Manager: Olive Pearson
Cartographic Editor: Sarah Phibbs
Picture Reasearch Managers: Thérèse Maitland, Jo Rapley, Alison Renney, Leanda Shrimpton
Typesetting: Brian Blackmore, Niki Moores
Production: Clive Sparling, Aleeta Cliff

Further reading

Cramp, S. (ed.) *Handbook of the Birds of Europe, the Middle East and North Africa*, volumes I–VI (Oxford University Press, Oxford, 1983)
Elder, N., Thomas, A.H. and Arter, D. *The Consensual Democracies? The Government and Politics of the Scandinavian States* (Oxford University Press, Oxford, 1988)
Embleton, C. (ed.) *The Geomorphology of Europe* (Macmillan, London, 1984)
Fullerton, B. and Knowles, R. *Scandinavia* (Paul Chapman, London, 1991)
Jamison, A., Eyerman, R. and Lasse, J. *The Making of the New Environmental Consciousness: a Comparative Study of the Environmental Movements of Sweden, Denmark and the Netherlands* (Edinburgh University Press, Edinburgh, 1990)
John, B. *Scandinavia: a New Geography* (Longman, London, 1984)
Jones, W.G. *Denmark: a Modern History* (Croom Helm, Dover, New Hampshire, 1986)
Mead, W.R. *A Historical Geography of Scandinavia* (Academic Press, London, 1981)
Polunin, O. *Flowers of Europe: a Field Guide* (Oxford University Press, Oxford, 1969)
Rutten, M.G. *The Geology of Western Europe* (Elsevier, London, 1969)
Singleton, F. *A Short History of Finland* (Cambridge University Press, Cambridge, 1989)
Varjo, U. and Tietze, W. (eds.) *Norden, Man and Environment* (Gebruder Borntraeger, Berlin, 1987)